Tilting Pad Thrust Bearing Selection Guide

WAUKESHA BEARINGS

A DOVER DIVERSIFIED COMPANY

WAUKESHA BEARINGS

Waukesha Bearings Corporation has an international reputation as a leading manufacturer of bearings for industrial, utility, government and marine applications. Our engineers have the expertise to provide cost effective designs within stringent performance specifications. We investigate, prepare and test new designs in our research and development lab. The results of this work have been significant contributions to the industry. In production, our skilled craftsmen use the finest manufacturing practices and materials. Quality control is an integral step of every process at Waukesha Bearings.

Unmatched service, design reliability and quality products are Waukesha Bearings trademarks.

A NOTE TO THE DESIGN ENGINEER

This selection guide provides a review of Waukesha tilting pad thrust bearings. Included is information on bearing performance, design considerations, and how to select the proper bearings for your application.

The bearings shown in this manual represent the most common styles and sizes found in a wide range of machinery. A variety of custom styles and sizes can be and have been manufactured. When designing new machinery it is often beneficial to consider bearings that are specially designed for your application. Bearings that are designed for specific applications can reduce weight, save space, and reduce power losses.

The engineering department of Waukesha Bearings is ready to assist you in selecting the best bearings for your application. Send us a sketch along with your specifications and performance requirements. We will respond promptly with a state-of-the-art bearing system design. On page 53 you will find a convenient data sheet which you can copy and use for your data inquiry.

We hope this guide will be helpful in your bearing selection. Please feel free to call us should questions arise regarding the design and application of these or other fluid film bearings.

Sincerely,

Willis W. Gardner
Vice President-Engineering

TABLE OF CONTENTS

Basic Principles of Hydrodynamic Thrust Bearing Operation 4

Thrust Bearing Design Styles 6

Options, Modifications and Accessories 10

Special Designs 12

Selection of Waukesha Tilting Pad Thrust Bearings 14

Thrust Bearing Assembly - Numbering System 15

Performance Data Curves 16

Dimensional Data Sheets 27

Supporting Technical Data 50

BASIC PRINCIPLES OF HYDRODYNAMIC THRUST BEARING OPERATION

Typical tilting pad thrust bearings consist of several basic components: a thrust collar, thrust pads, support discs, leveling links and a base ring or retainer. The thrust collar may be a separate item mounted onto the shaft or it may be an integral part of the shaft. When the shaft is rotating, axial (thrust) forces are transferred from the thrust collar to the thrust pads, through a film of oil that is self-generated between the collar and the pads. The thrust force then passes from the thrust pads through the support discs, leveling links and retainer, to the bearing housing, and finally to the foundation or machine support (Figures 1, 1A).

To develop a hydrodynamic film in a bearing, three factors are required:

a) Viscous fluid
b) Relative motion
c) Converging geometry

Figure 1 - Thrust Bearing Components

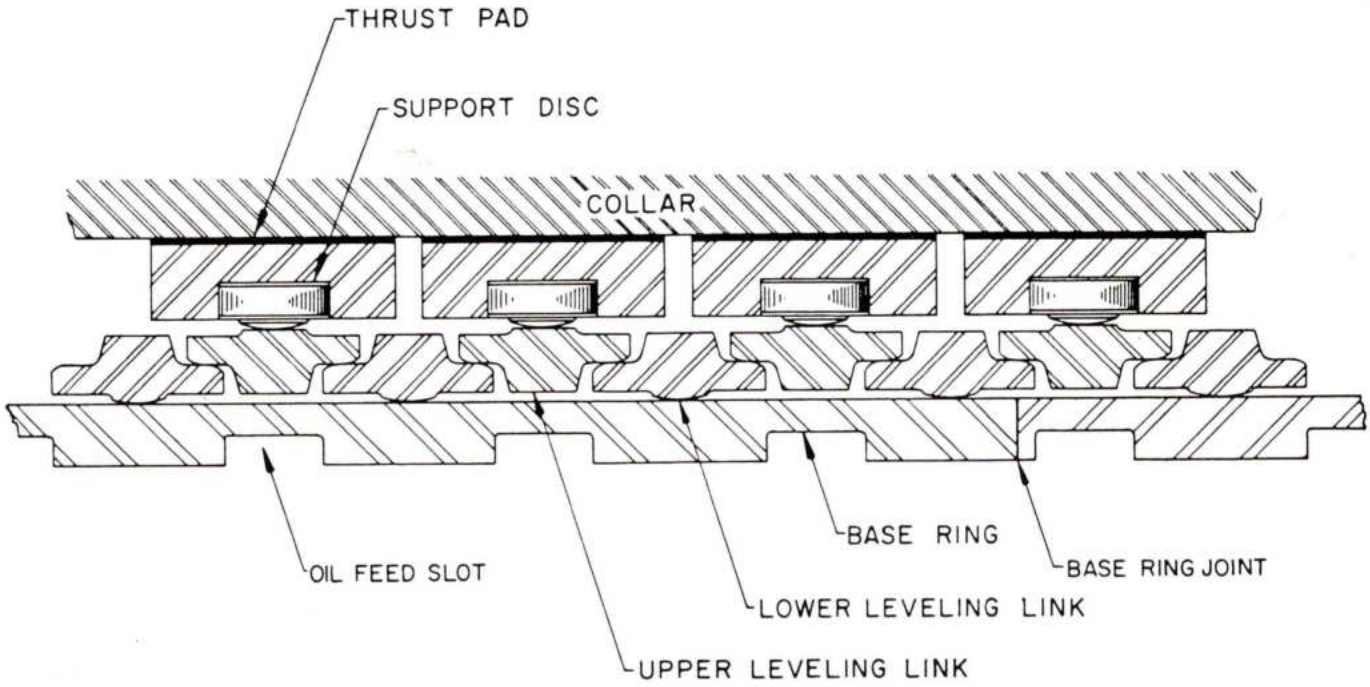


Figure 1A

The first factor, viscous fluid, is available since the bearings under consideration are fluid-lubricated (primarily with oil). Relative motion is provided by the sliding action between the surface of the thrust collar and the surface of the pads. Converging geometry is machined into the pads of a fixed plate (thrust bearing) or provided by the tilting action of the pads (tilting pad type thrust bearings). The taper or wedge angle in these bearings is quite small; typically one in two thousand (about 2 inches in 100 yards), and is exaggerated in Figure 2 only for clarity. Close tolerances in machined parts are required to properly develop these hydrodynamic load-carrying fluid films.

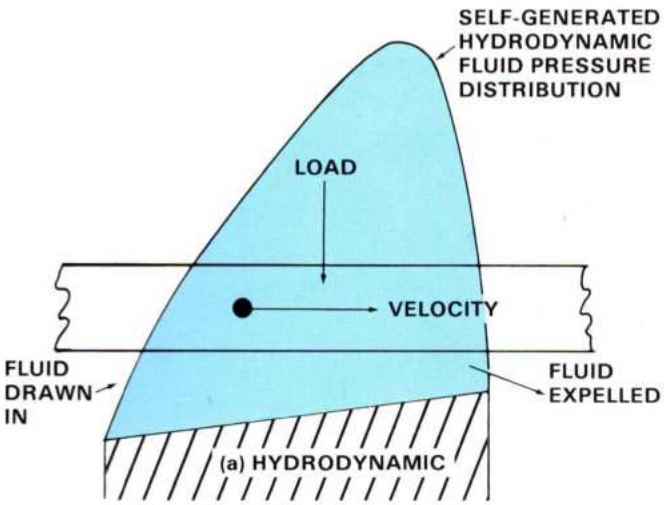


Figure 2 - Geometry and Pressure

The principles of pressure build-up in the oil film are shown in Figure 2. Oil adheres to the moving (and stationary) surfaces and is thus carried into the converging space. Since oil is basically incompressible, pressure builds within the converging oil film, and this pressure provides a means for the oil film to transfer the load from the collar to the thrust pads.

For the bearing and associated machinery to operate satisfactorily, it is important that the oil film fully separates the thrust collar and the thrust pad at all times. However, during start-up and shut-down there are momentary periods when the combination of relative speed and load does not generate a full film, and at least some metal-to-metal contact results. Operating conditions such as these dictate the use of material combinations such as babbitt faced thrust pads operating against a steel collar which allow metal-to-metal contacts to occur without surface damage.

Although hydrostatic lift may be used at start-up and shut-down to protect against metal-to-metal contact, a good bearing material, such as babbitt, is still essential to provide protection against momentary contact that might occur due to temporary overload (shocks), the passing of foreign material through the bearing clearance, or misalignment.

Many types of bearing materials are available. Each has its own advantages and limitations (Figure 3). Tin base babbitt meets desired bearing properties such as compatibility, corrosion resistance, conformability and embeddability to such a high degree that it is widely used and accepted. The majority of the bearings in this guide use tin base babbitt as the bearing material.

PROPERTIES OF BEARING ALLOYS

Bearing Material	Hardness Room Temp. Brinell	Min. Shaft Hardness Brinell	Compatibility*	Conformability and Embeddability*	Corrosion Resistance*
Tin-Base Babbitt	20-30	150 or less	1	1	1
Lead-Base Babbitt	15-20	150 or less	1	1	3
Copper-Lead	20-30	300	2	2	5
Tin Bronze	60-80	300-400	3	5	2
Lead Bronze	40-80	300	3	4	4
Aluminum Alloy	45-50	300	5	3	1

*Arbitrary scale with 1 being the best material and 5 the worst.

Figure 3

THRUST BEARING DESIGN STYLES

Waukesha Bearings designs and manufactures a wide variety of thrust bearings to suit specific customer application needs. This selection guide provides information to enable the designer to specify a suitable bearing for most applications.

The simplest type of thrust bearing is the **flat land thrust plate** shown in Figure 4. Thrust plates normally have babbitt facing on a steel backing and are used for light loads (typically to 75 PSI). Thrust plates require a minimum of axial space and are often used for positioning.

Thrust plates can carry a higher load (typically to 250 PSI) when **tapered-lands** are machined into the babbitt surface. These tapers provide a well-defined converging geometry for increased load capacity compared to flat surface thrust plates.

Thrust plates can be used in conjunction with tilting pad bearings to act as a reverse or bumper thrust bearing.

Tilting pad thrust bearings are designed so that oil on the rotating collar enters the leading edge of the pad, causing the pad to tilt slightly. This tilting action creates the wedge required for hydro-dynamic operation. These bearings are available in both non-equalizing and self-equalizing designs.

Non-equalizing thrust bearings can be used where rotor-to-stator alignment is initially accurate and is well maintained in service. Where shaft alignment can be maintained, non-equalizing bearings, Figure 5, can carry loads comparable to similar size equalizing bearings.

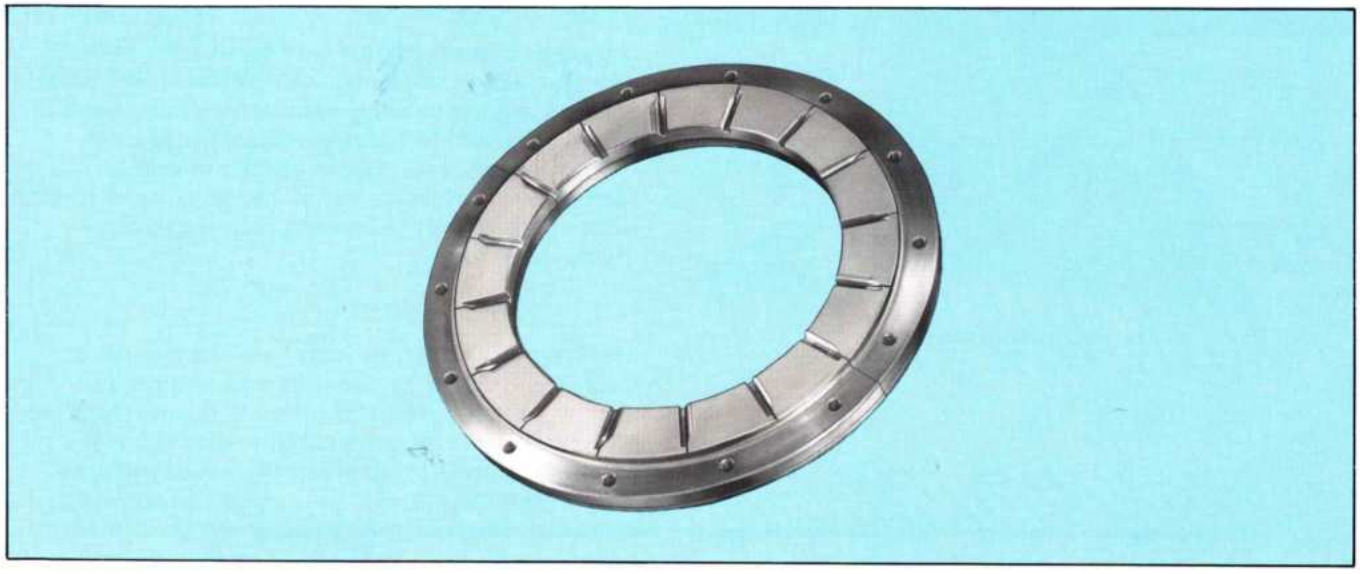


Figure 4 - Thrust Plate

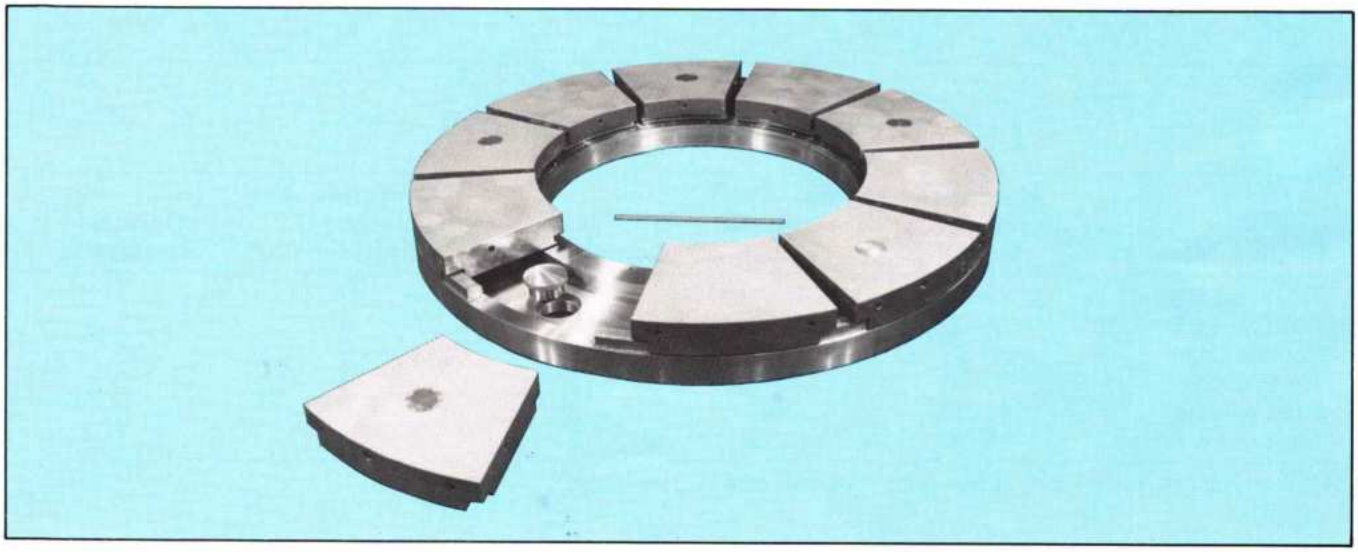


Figure 5 - Non-Equalizing Tilting Pad Thrust Bearing

Where accurate shaft alignment cannot be assured, a **self-equalizing tilting pad thrust bearing** should be selected. The most common of these designs are assemblies with six thrust pads and a pad outside diameter to inside diameter ratio of 2:1. An example of this design is shown in Figure 6. These bearings use a series of levers (leveling links) to control pad height so that the load is shared equally by all pads. Self-equalizing tilting pad thrust bearings with center pivots typically support loads to 500 PSI.

Eight pad bearings have gained increased acceptance by designers of rotating machinery. Standard designs are dimensionally interchangeable with six pad bearings and may include retained pads. This feature makes unit assembly easier by holding the pads to the retainer when installing the bearing.

On eight pad bearings with an OD to ID relationship of 2:1, the ratio of the pad arc length at mid-radius (B) to pad radial length (L) is 1:1 as compared to a 4:3 ratio on six pad bearings. This shorter length reduces undesirable pad deflections resulting in greater load capacity (Figure 7).

See page 51 for additional information on "Number of Pads."

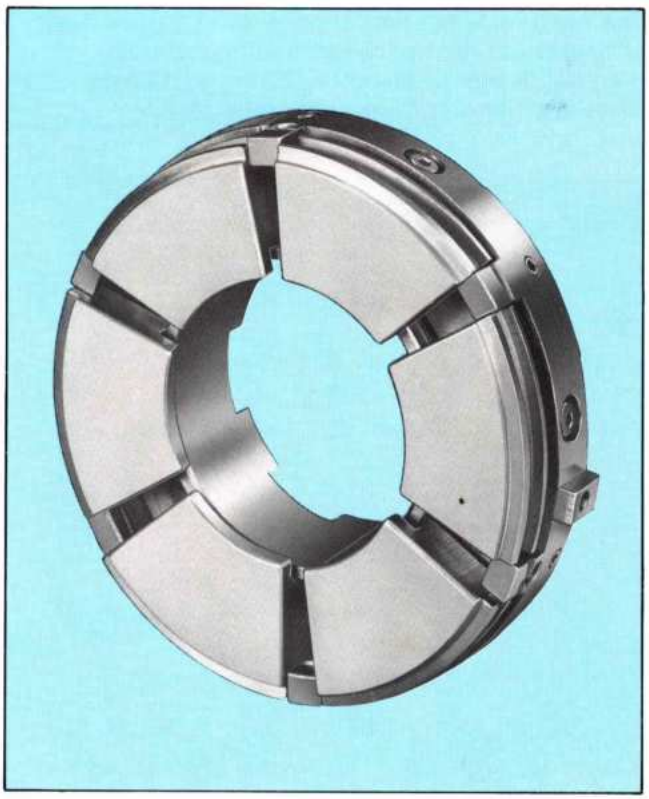


Figure 6 - Self-Equalizing Tilting Pad Thrust Bearing

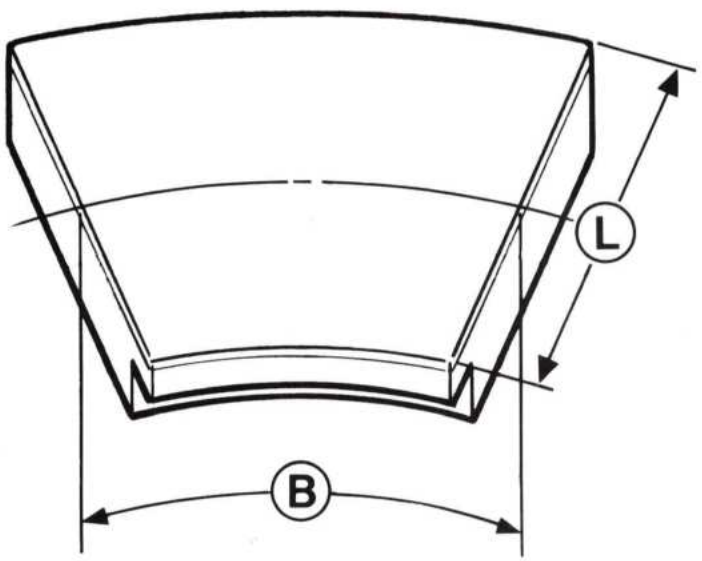


Figure 7 - Pad Length to Width Ratio

The need for a bearing to carry even higher loads or operate at further reduced temperatures resulted in the development of the Waukesha **"HyFilm" Thrust Bearing** (Figures 8, 8A).

Figure 8 - HyFilm Bearing

The HyFilm bearing incorporates a variety of unique features developed through years of experience and engineering research. These features help reduce undesirable pad deflections, increase the efficiency of the leveling system and, as a result, increase the load capacity. These features make the HyFilm bearing an excellent consideration for any application where operating temperatures need to be reduced, where operating efficiency is critical, or where increased load capacity is needed.

The pads are designed with a B/L ratio of 1:1 for better control of circumferential deflections. In addition, a radial rib support, in lieu of a conventional button, on the back surface of the pads reduces radial deflections. The result is an even thicker oil film. These pads are shown in Figure 9.

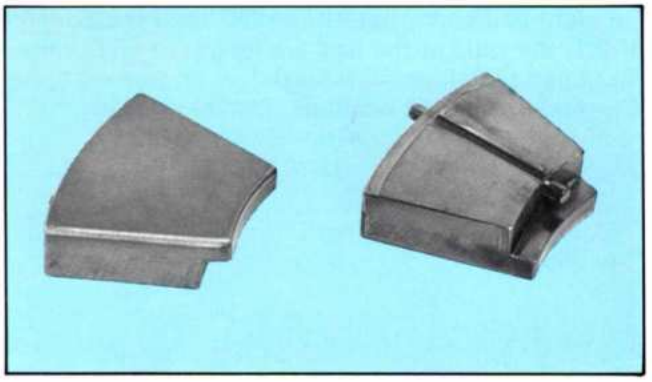


Figure 9 - HyFilm Pads

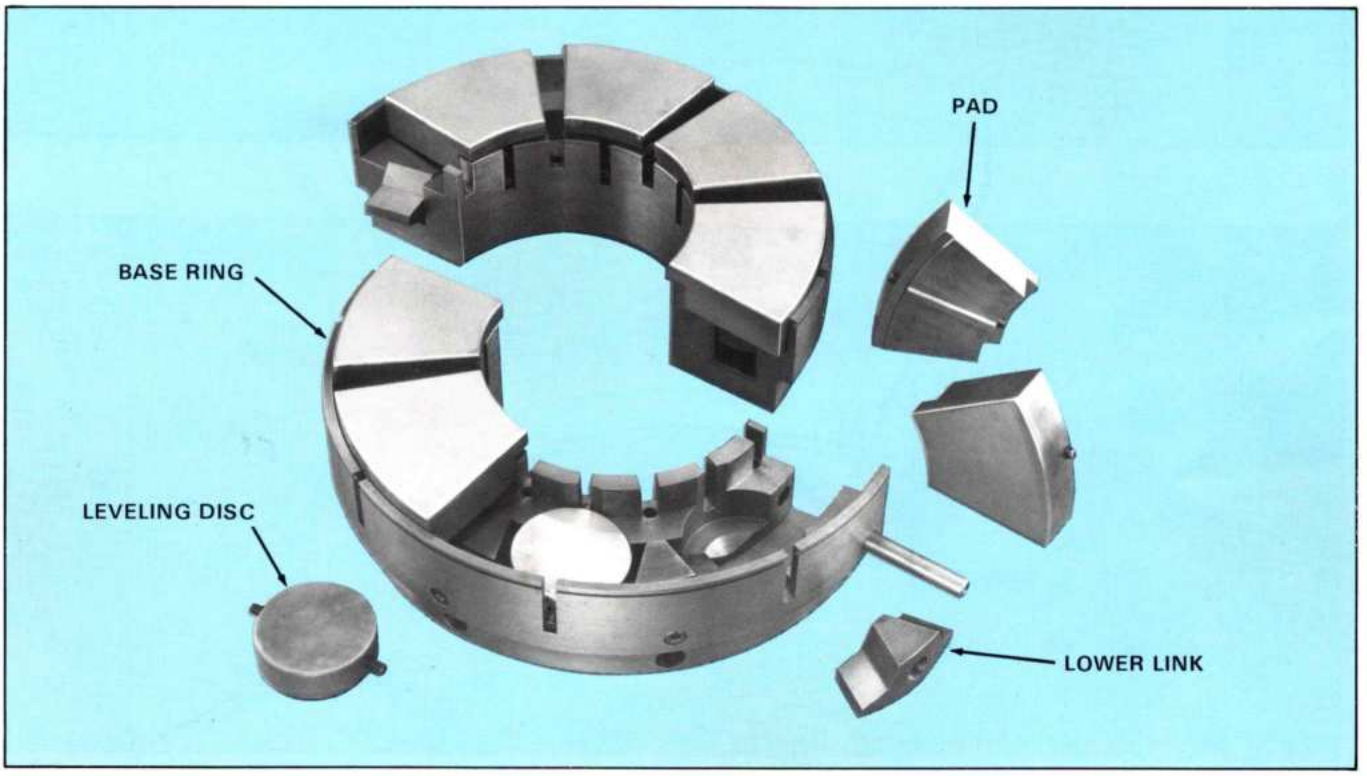


Figure 8A - HyFilm Components

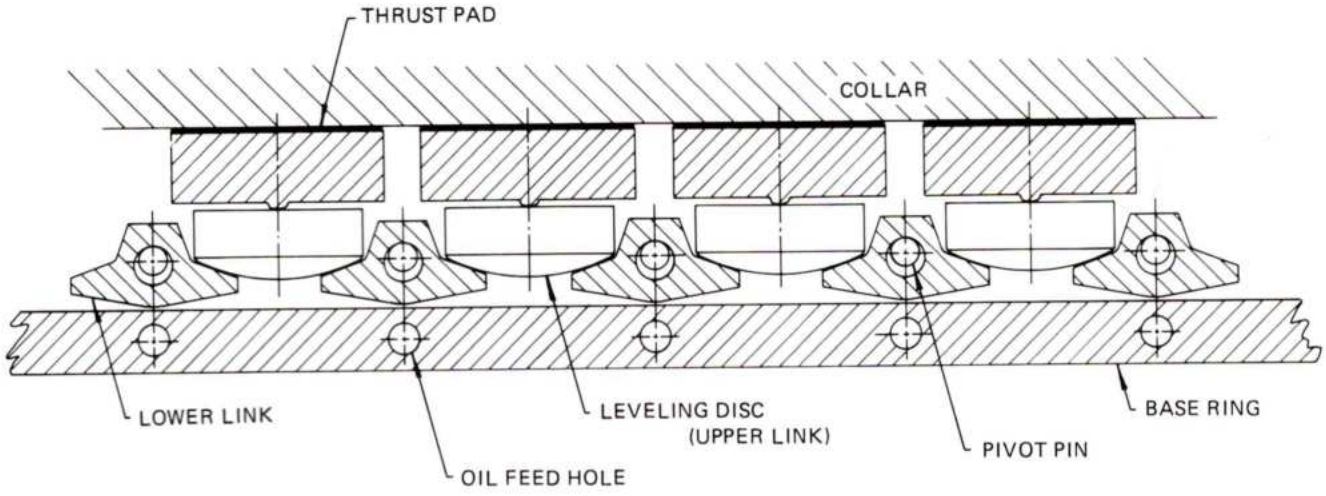


Figure 10

A unique new leveling system includes a leveling "disc" in place of conventional upper leveling links. The flat top surface of the leveling "disc" contacts the pad support rib providing the pad with a radially stiff support. A spherical surface on the bottom of the "disc" allows the bearing to align radially. This leveling system is shown in Figure 10.

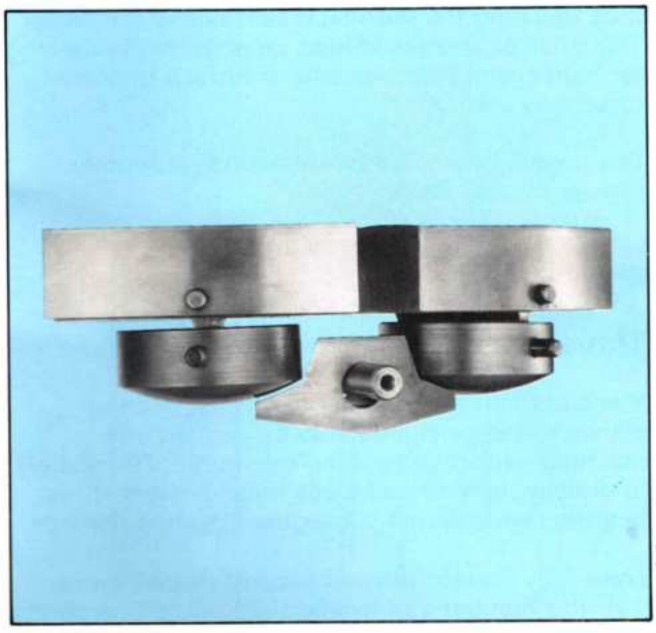
The design of the lower leveling links has also been modified. The lower link pivot point has been aligned with the projection of the top surfaces of the lower link which contacts the spherical bottom surface of the leveling "disc" (or upper link). This feature provides a more efficient leveling system that better distributes the load among the pads.

Summarized, the "HyFilm" bearing provides:

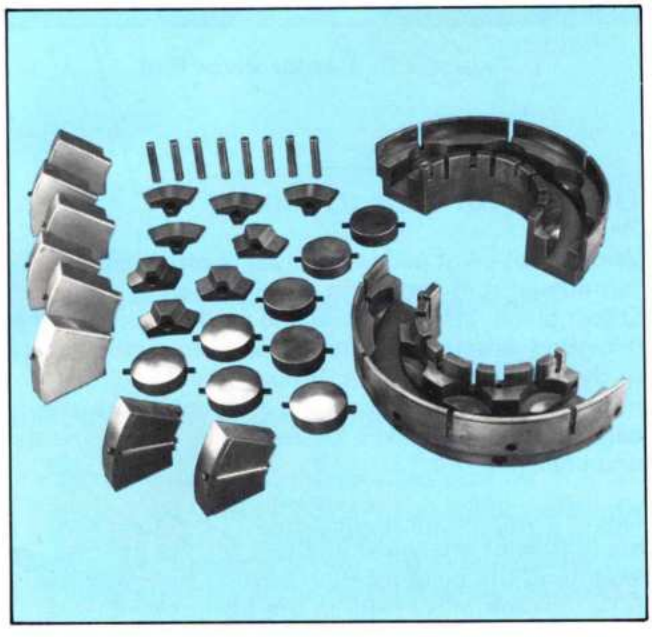
- New Pad Design = Thicker Oil Film.
- New Leveling System = Better Shared Load Among Pads.

Results: Higher Load Capacity
and/or
Reduced Operating Temperatures

Whether upgrading a current machine or designing a new one, the Waukesha "HyFilm" tilting pad thrust bearing is an excellent choice.



HyFilm Pads and Linkage System



HyFilm Components

OPTIONS, MODIFICATIONS AND ACCESSORIES

Waukesha Bearings offers a variety of options, special modifications, and accessories for tilting pad thrust bearings. These options allow the designer to tailor a bearing for any specific application. The following are brief descriptions of some of the most commonly selected options.

THRUST PAD OPTIONS

Center Pivot Pads (Standard)

Center pivot thrust pads are used for most applications. Center pivots provide good load capacity regardless of the direction of rotation (Figure 11).

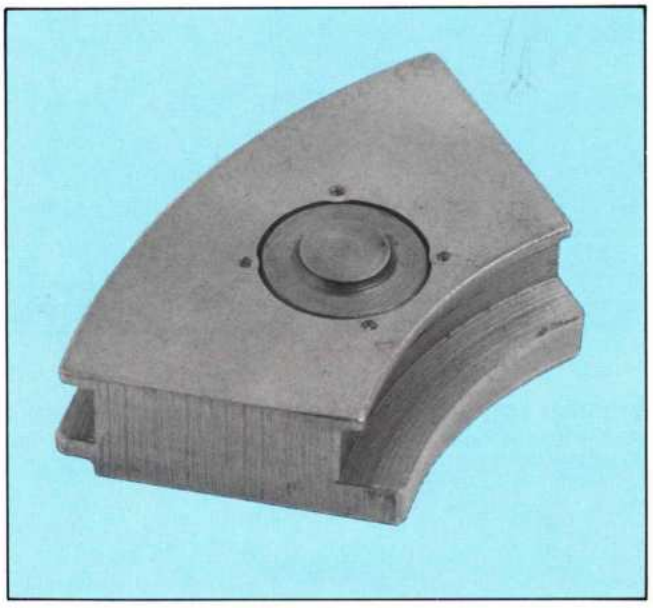


Figure 11 - Center Pivot Pad

Offset Pivot Pads (Optional)

With offset pivot pads, the pivot is offset circumferentially from center, in the direction of rotation. Offset pivots provide increased load capacity in the designed direction of rotation and reduced capacity in the opposite direction. Properly selected, bearings with offset pivots can be smaller in size and can thus reduce power losses, space requirements and costs (Figure 12).

Offset pivots result in improved bearing performance. Recent analytical and test results indicate extending the pivot location beyond the traditional 60% location may result in the best overall performance. See page 50 for more information on offset pivots.

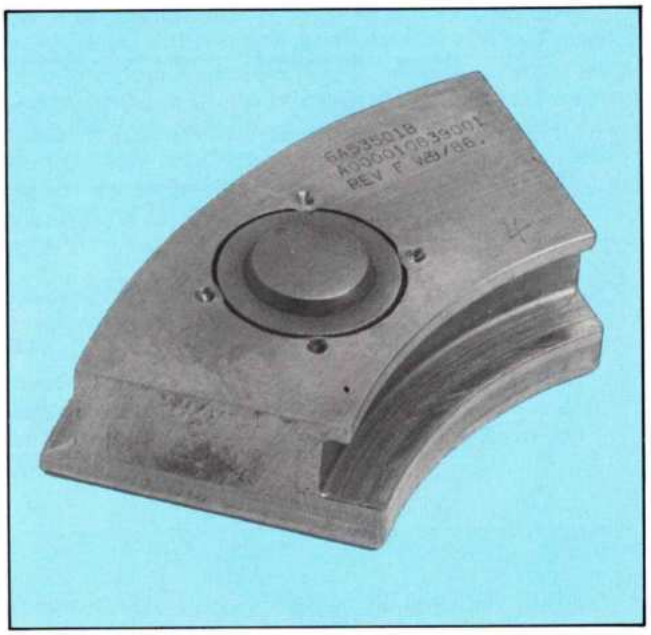


Figure 12 - Offset Pivot Pad

Steel Backed Pads (Standard)

Steel backed pads are used for most bearing applications and provide high strength at low cost.

Copper Alloy Backed Pads (Optional)

The high thermal conductivity of the chrome-copper alloy backing material of these pads reduces the thermal gradients through the pads, thus reducing the thermal distortions of the pads. This enables increased load capacity, particularly for high speed bearings where surface temperatures may be high.

See page 51 for more information on Chrome-Copper Backed Pads.

Thrust Load Measurement

Measurement of the load on a thrust bearing allows thrust calculations to be verified and machine performance to be monitored. The ability to directly monitor pad loads helps prevent thrust bearing overload and subsequent bearing damage.

Load cells replace the pad support discs (Figure 13). The number and location of load cells depends on the application. Consult Waukesha Bearings for assistance in load cell selection.

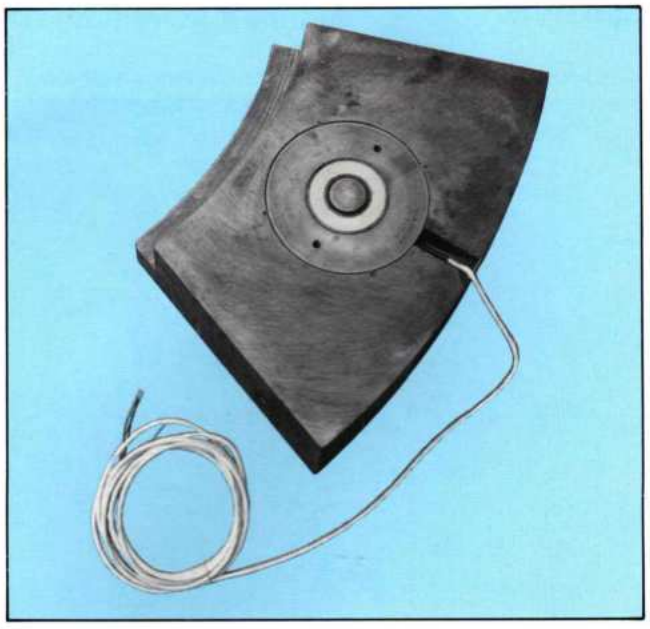


Figure 13 - Load Cell Pad

Temperature Measurement

Bearing temperature is an excellent and well accepted parameter for monitoring bearing performance. To measure bearing temperature, two types of sensors are commonly used; the simplest is the thermocouple (TC). Resistance temperature detectors (RTD) are also available. An RTD sensor is shown in Figure 14. The type of sensor selected normally depends on its compatibility with other instrumentation within the system.

Temperature detectors are typically installed in one of two ways: embedded in the babbitt, or in the pad backing material just below the babbitt bond line as shown in Figure 14.

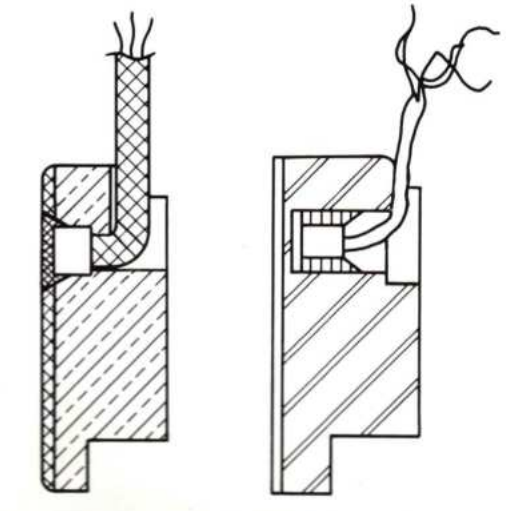


Figure 14

Oil Seal Rings

Waukesha oil seal rings control oil leakage from the thrust bearing compartment in the bearing housing. Both split and non-split ring options are available.

Hydrostatic Lift System

Hydrostatic lift provides an oil film prior to the start of rotation to reduce starting torque. Thrust pad faces are relieved and pads are drilled for use with a high pressure oil system. This oil pressure generates a static oil film to separate the bearing and collar surfaces prior to start-up. This configuration is shown in Figure 15.

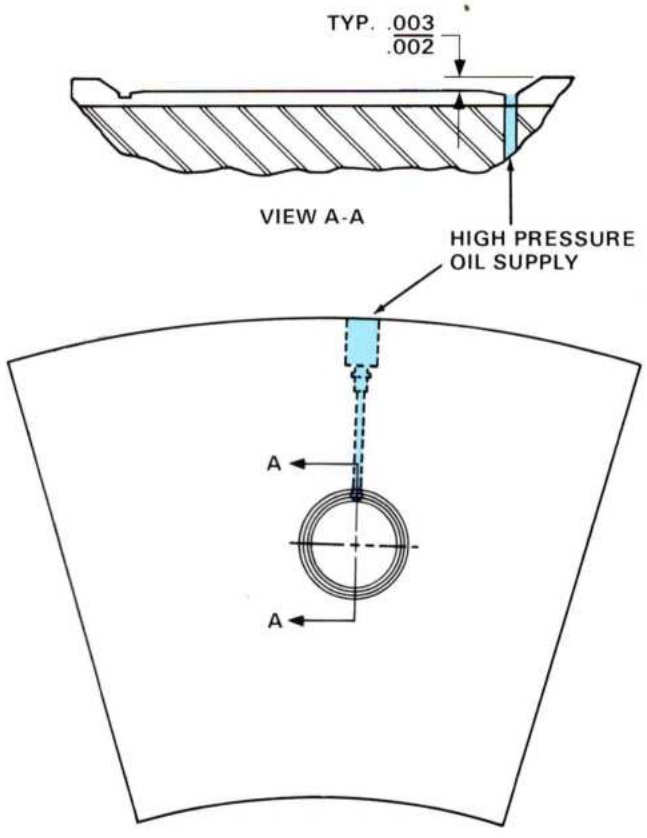


Figure 15 - Hydrostatic Lift Machining

Directed Flow Lubrication

Directed flow lubrication introduces cool oil between thrust pads directed to the leading edge of the pad. In certain applications this feature may reduce power losses and may also eliminate the need for shaft seals at the thrust bearing. Consult Waukesha Bearings to determine whether directed flow lubrication may be the best solution for a proposed application.

Where application requirements call for a thrust bearing not described in this guide, experienced Waukesha engineers work closely with customer engineers to custom design a bearing for the application. Typical types of special designs are described in the following paragraphs.

Large Non-Equalizing Thrust Bearings

Large non-equalizing thrust bearings (as shown in Figure 16), are used on roller mill drives. The rigidity of this type of bearing accommodates off-center thrust loads without transferring load to the journal bearings. Thrust pad faces may be machined for hydrostatic lift. This feature provides a film of oil prior to start-up and shut-down to reduce starting torque and help prevent bearing damage.

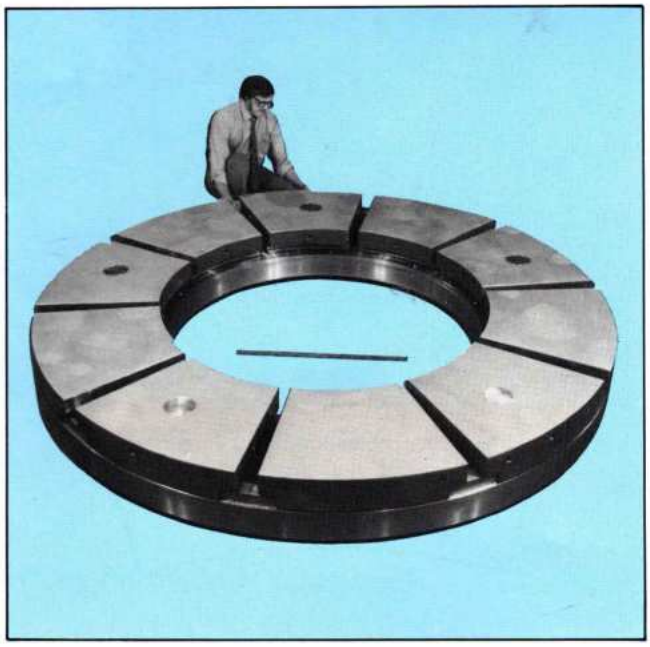


Figure 16 - Non-Equalizing Bearing

Adjustable Jack Screw Thrust Bearings

Adjustable jack screw thrust bearings (as shown in Figure 17) are commonly used in vertical shaft hydroelectric turbine-generators. Jack screws located under the pads, are used to adjust the bearing height and plumb the shaft.

Figure 17 - Jack Screw Bearing

Thrust Blocks

Thrust blocks incorporate a thrust bearing in a housing. Thrust blocks may include a journal bearing in a common housing as shown in Figure 18. This bearing configuration accommodates axial loads in either direction and also accommodates radial loads. Thrust blocks are available as free-standing units or as thrust bearing elements only.

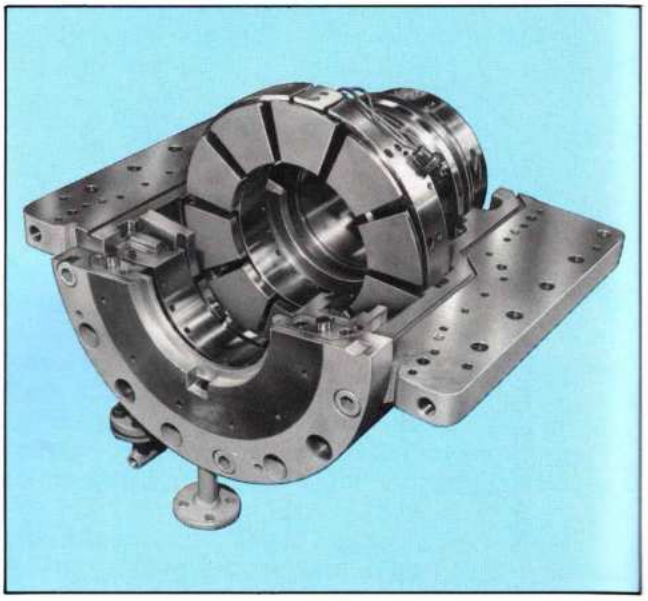


Figure 18 - Thrust Block

Combination Bearings

A combination thrust and journal bearing can be designed using a common bearing shell or retainer as shown in Figure 19. Combination bearings such as these are commonly utilized when axial space is limited and can be designed with either sleeve type or tilting pad journal bearings.

Figure 19 - Combination Bearing

Two Pad Design

A two pad equalizing thrust bearing design (as shown in Figure 20) is available for applications where thrust loads are light. These bearings are commonly used as the idle bearing in a double thrust bearing system where shaft positioning is required, but the reverse thrust loads are light. Because only two pads are used, horsepower losses are reduced.

Figure 20 - Two-Pad Bearing

Non-Oil-Lubricated and Non-Babbitt Bearings

Thrust bearings can operate in lubricants other than oil. Thrust pads can be manufactured with facings of various materials including plastic laminates and elastomers. A phenolic faced bearing is shown in Figure 21.

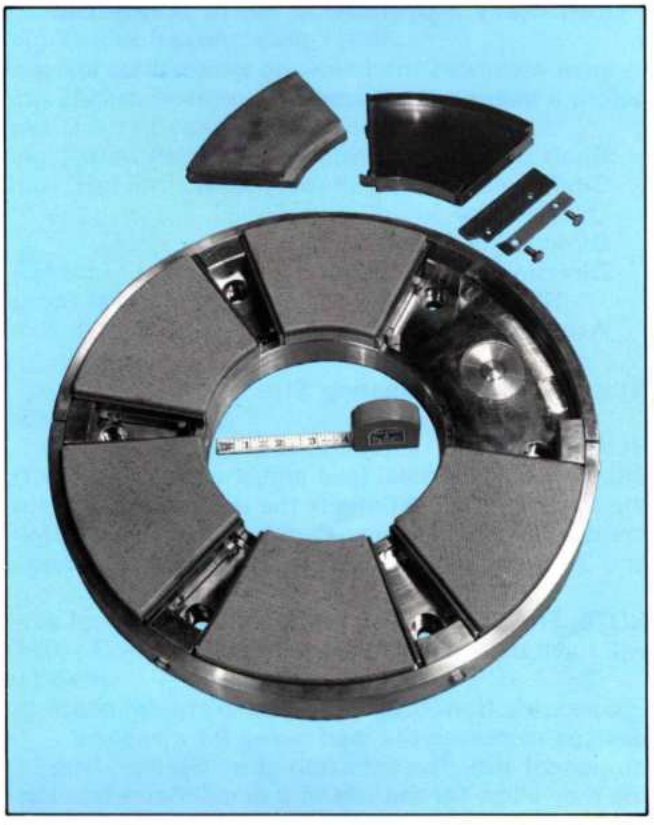


Figure 21 - Phenolic Laminate Bearing

SELECTION OF WAUKESHA TILTING PAD THRUST BEARINGS

Preliminary selection of a Waukesha tilting pad thrust bearing may be made using the information contained on the following pages.

Preliminary Application Data Available

In most instances the following data will be known before a bearing is selected.

Shaft Size
Shaft Speed (RPM)
Oil Viscosity
Direction of Rotation
Direction(s) of Axial Load
(Single or Double Bearing?)
Axial Load (Lbs Force)

Step One: Select Bearing Size

Refer to the load rating charts on pages 18 to 20. Based on known axial load and shaft speed, select the bearing that best meets the desired requirements. Load ratings given are for both 150 SSU and 300 SSU oil at 120° F inlet temperature.

NOTE: The bearing with the smallest numerical size will have the lowest frictional power loss.

Progressing from 6 pad to 8 pad to HyFilm bearing designs increases the load rating for a specific numerical size. The selection of a "HyFilm" bearing may allow for the use of a smaller size bearing or may increase the margin of safety.

Step Two: Check for Fit with Shaft

Refer to the appropriate dimensional page for the size of bearing selected to assure the shaft will fit through the bearing bore.

If the shaft will fit through the bearing bore proceed to step three.

If the shaft will not fit through the bearing bore, refer back to the load rating charts on pages 18 thru 20 and check the ratings of the six (6) pad "Large Bore" bearings and nine (9) pad "HyFilm" bearings. These bearings share the same numerical sizing as standard bearings but offer a larger bore to outside diameter ratio than standard bearings and may accommodate the larger shaft size.

If the shaft still will not pass through the large bore bearing, check the next largest standard bore bearing.

NOTE: Before choosing a larger bearing than otherwise dictated by the application, consult Waukesha Bearings. In many cases a special bearing such as those listed on pages 46 thru 49, can be used to meet the desired requirements while still keeping power losses to a minimum. In addition to the special bearings listed in this guide, Waukesha Bearings also offers custom-made bearings designed specifically for a wide variety of applications.

Step Three: Determine Power Loss

Refer to the power loss charts on pages 21 thru 24 for the bearing configuration and oil viscosity that will be used. Power loss is listed in the left hand margin at the point where unit size and rotational speed intersect.

NOTE: Power losses are based on operation at rated loads and will be somewhat lower when operating at lighter loads. Values assume open tangential discharge. Consult Waukesha Bearings for power loss calculations for specific applications.

Power losses are also based on using the recommended cold end clearances shown on page 17. Changing these clearances will result in minor changes to the power losses of the unloaded side bearing.

Step Four: Determine Oil Flow Requirements

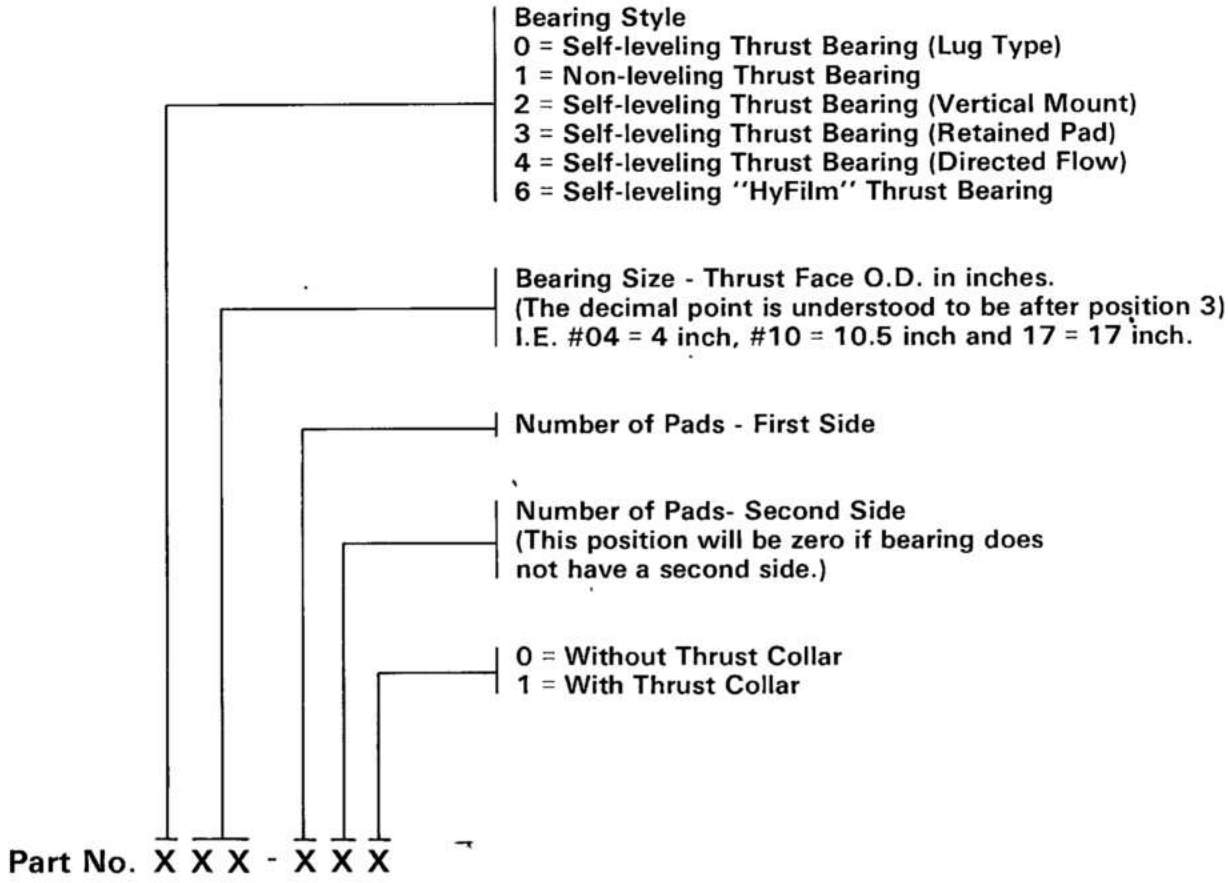
Refer to the charts on pages 25 and 26 to find the oil flow requirements for single bearings based on oil viscosity and standard bore or large bore configuration. To determine oil flow requirements for double bearings, multiply figures on these charts by two (x2).

Step Five: Check Selection with Waukesha Bearings

Waukesha Bearings will be pleased to review each selection to assure that the most efficient and economical bearing for the application has been chosen. Simply fill out the "application data sheet" on page 53 and mail it to Waukesha Bearings. It will receive our prompt attention.

THRUST BEARING ASSEMBLY - NUMBERING SYSTEM

Waukesha thrust bearings are identified by a six digit part number. The first three digits indicate the style and size of bearing. The last three digits identify number of pads, double or single bearings, with or without collars. Specific designations for each digit are as follows:



PERFORMANCE DATA CURVES

Data	Bearing Type	Exhibit	Page
I. COLD END CLEARANCE	ALL BEARINGS - FOR NORMAL CONDITIONS	1	17
II. LOAD RATING	HYFILM, 8-PAD	2	18
	HYFILM, 9-PAD	3	18
	STANDARD 8-PAD	4	19
	STANDARD 6-PAD, STANDARD BORE	5	19
	STANDARD 6-PAD, LARGE BORE	6	20
III. POWER LOSS	SINGLE, STANDARD BORE, 150 SSU OIL	7	21
	SINGLE, LARGE BORE, 150 SSU OIL	8	21
	DOUBLE, STANDARD BORE, 150 SSU OIL	9	22
	DOUBLE, LARGE BORE, 150 SSU OIL	10	22
	SINGLE, STANDARD BORE, 300 SSU OIL	11	23
	SINGLE, LARGE BORE, 300 SSU OIL	12	23
	DOUBLE, STANDARD BORE, 300 SSU OIL	13	24
	DOUBLE, LARGE BORE, 300 SSU OIL	14	24
IV. OIL FLOW	SINGLE, STANDARD BORE, 150 SSU OIL	15	25
	SINGLE, LARGE BORE, 150 SSU OIL	16	25
	SINGLE, STANDARD BORE, 300 SSU OIL	17	26
	SINGLE, LARGE BORE, 300 SSU OIL	18	26

150SSU = ISO VG 32

300SSU = ISO VG 68

RECOMMENDED COLD END CLEARANCE FOR NORMAL CONDITIONS

EXHIBIT 1

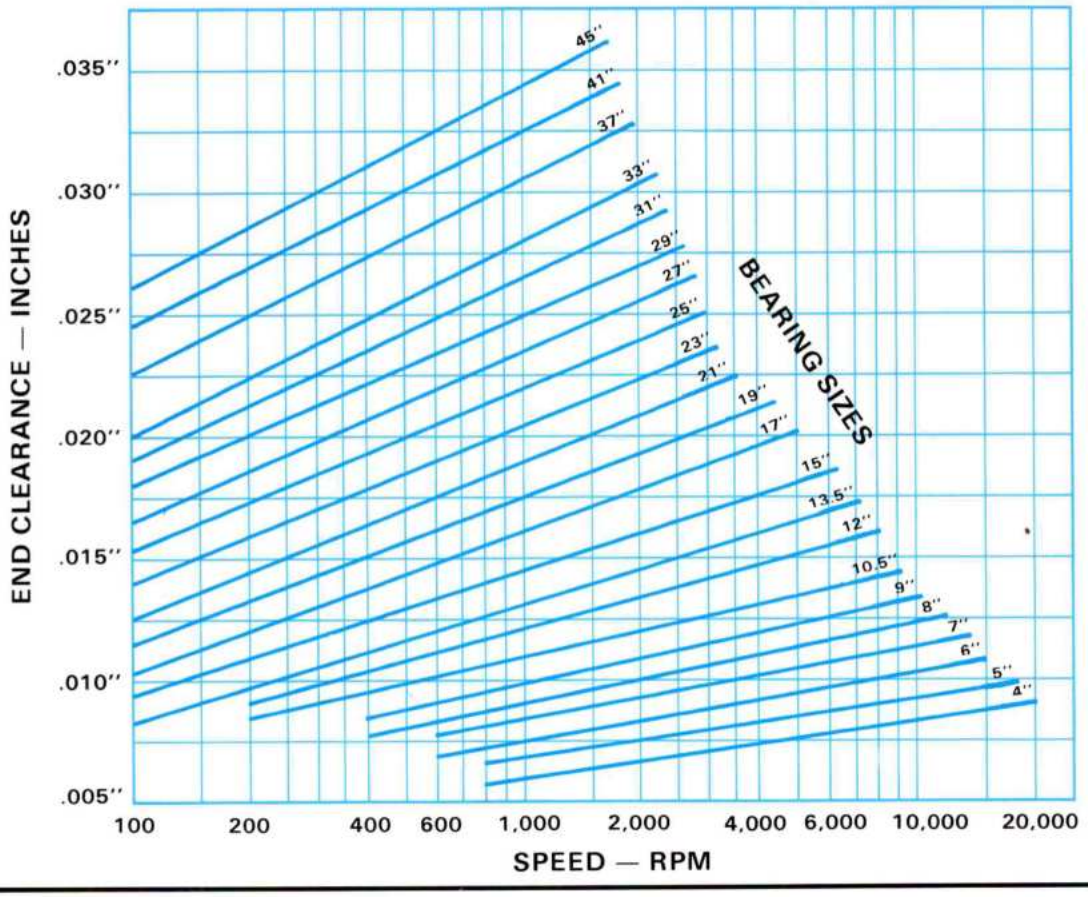


EXHIBIT 2

LOAD RATING
EIGHT PAD HYFILM THRUST BEARINGS
CENTER PIVOT, STEEL BACKED PADS

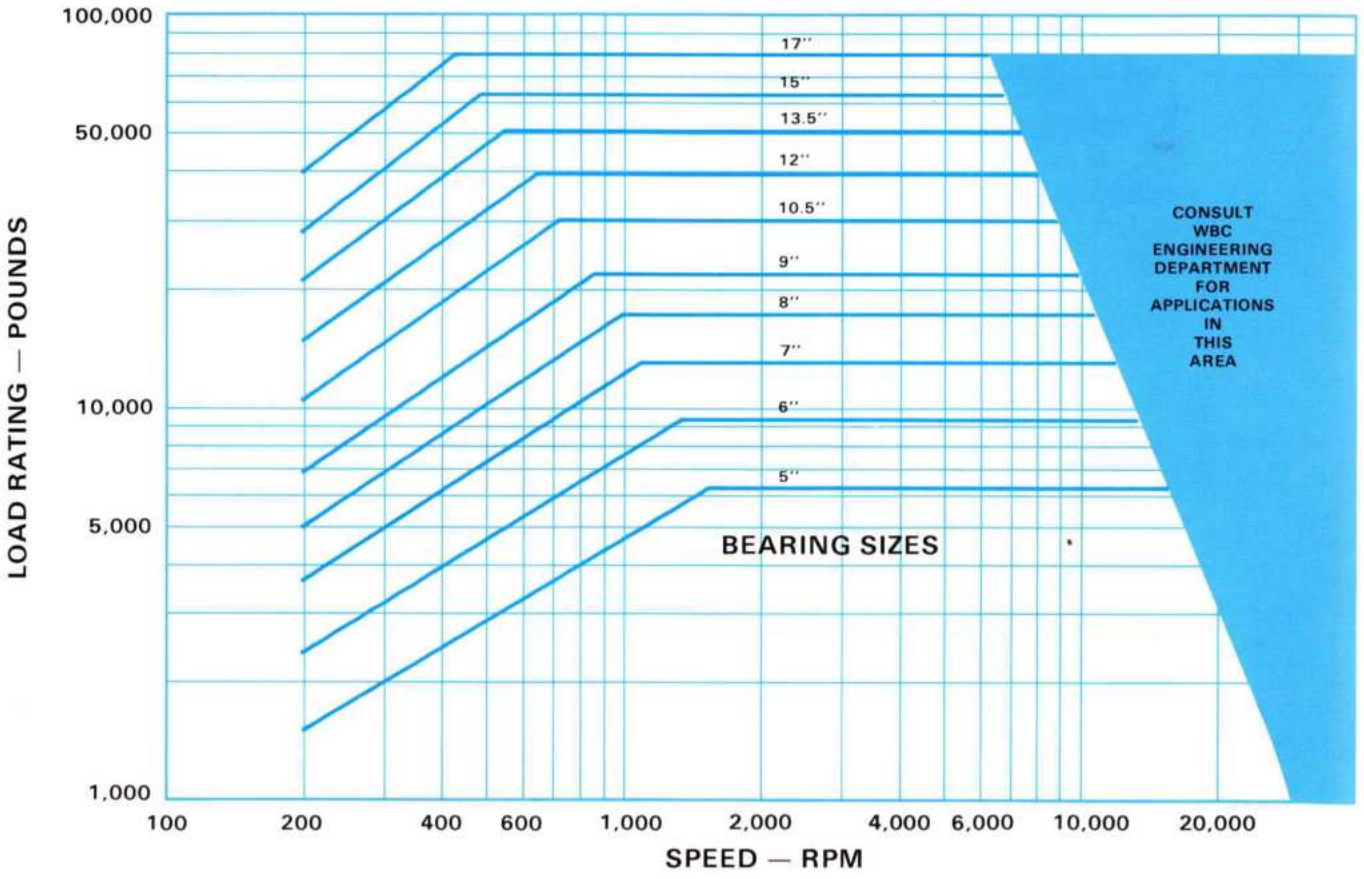


EXHIBIT 3

LOAD RATING
NINE PAD HYFILM THRUST BEARINGS
CENTER PIVOT, STEEL BACKED PADS

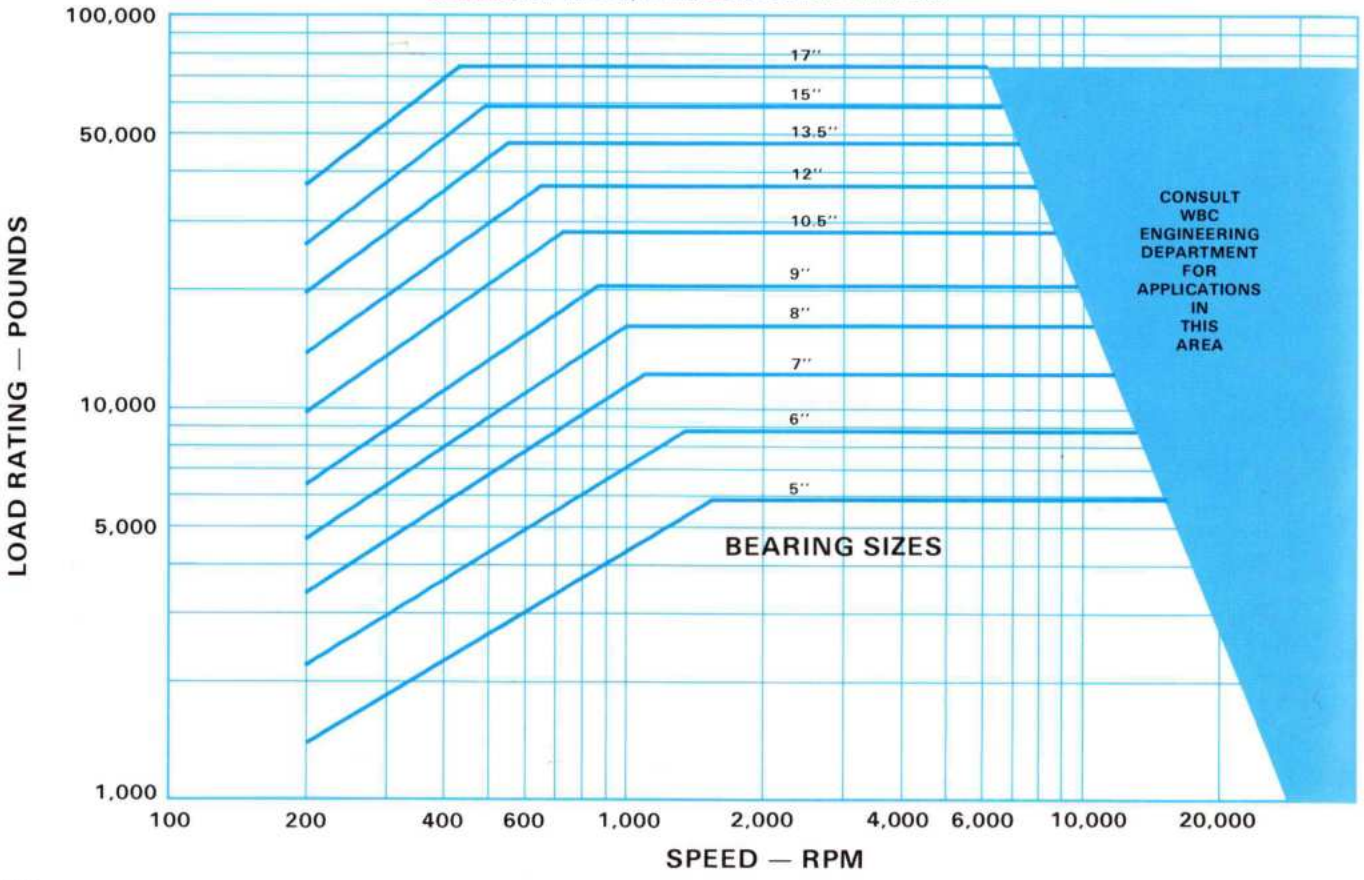


EXHIBIT 6

LOAD RATING
SIX PAD THRUST BEARINGS

CENTER PIVOT, STEEL BACKED PADS - LARGE BORE

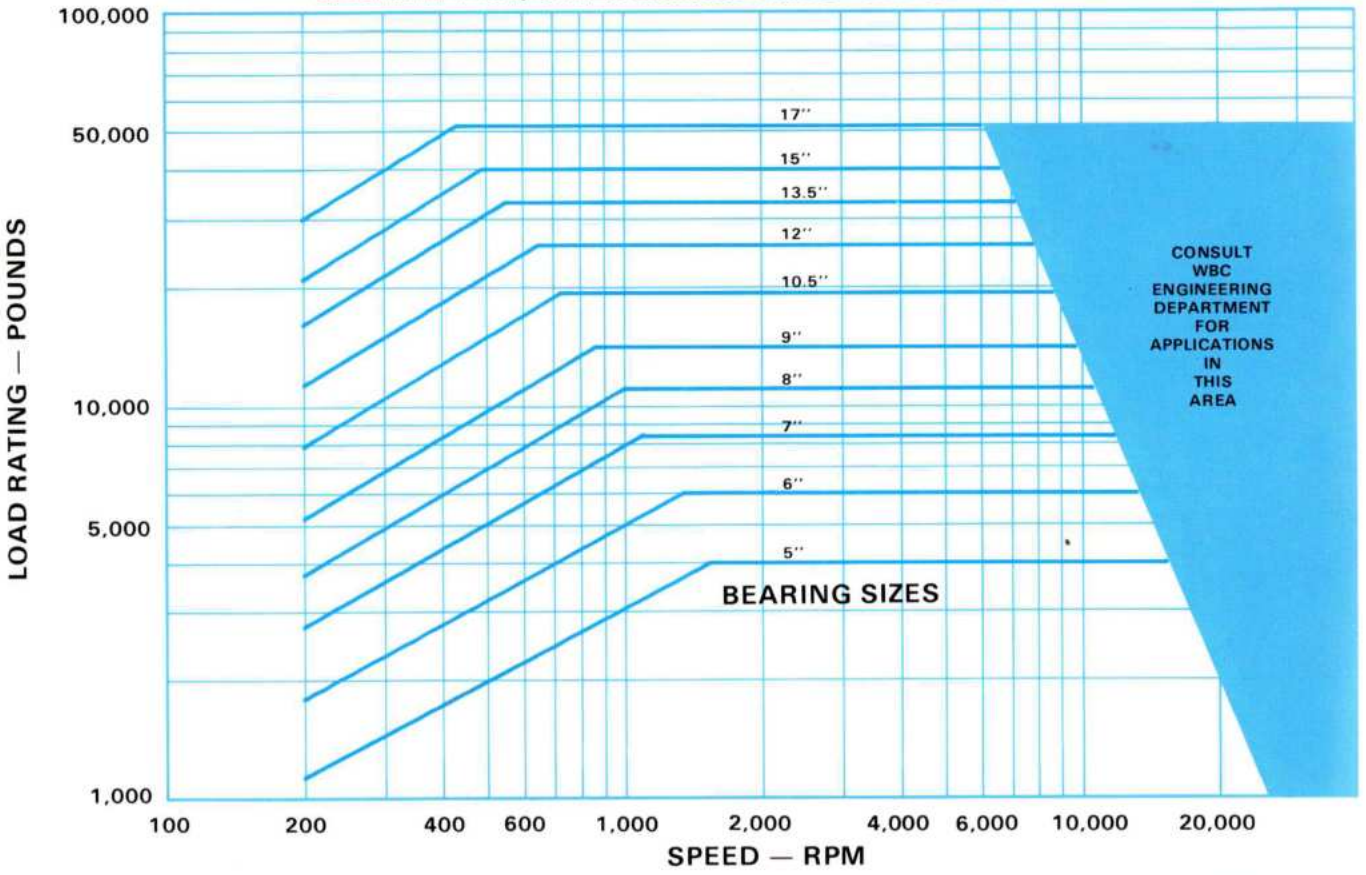


EXHIBIT 7

POWER LOSS
TILTING PAD THRUST BEARING (SINGLE)
STANDARD BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

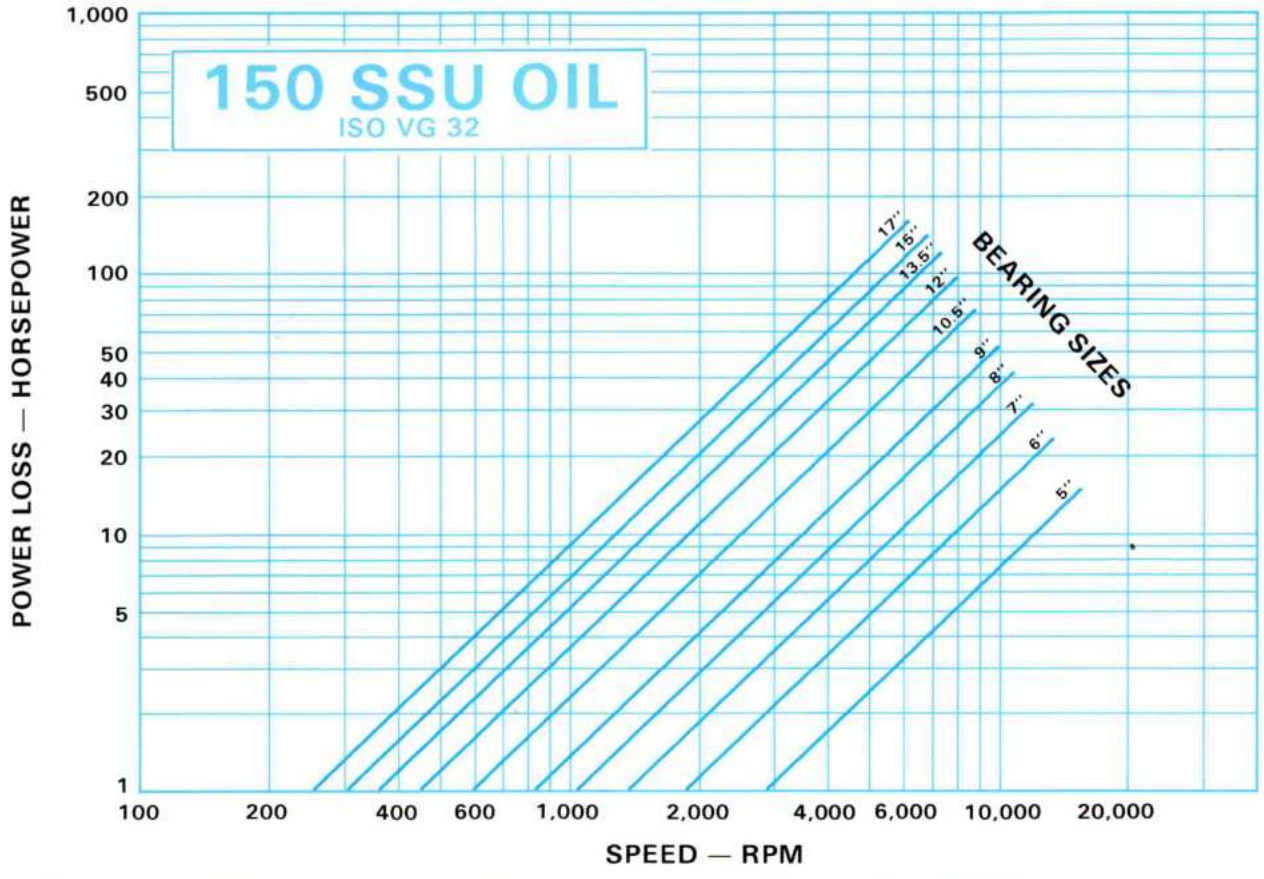


EXHIBIT 8

POWER LOSS
TILTING PAD THRUST BEARING (SINGLE)
LARGE BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

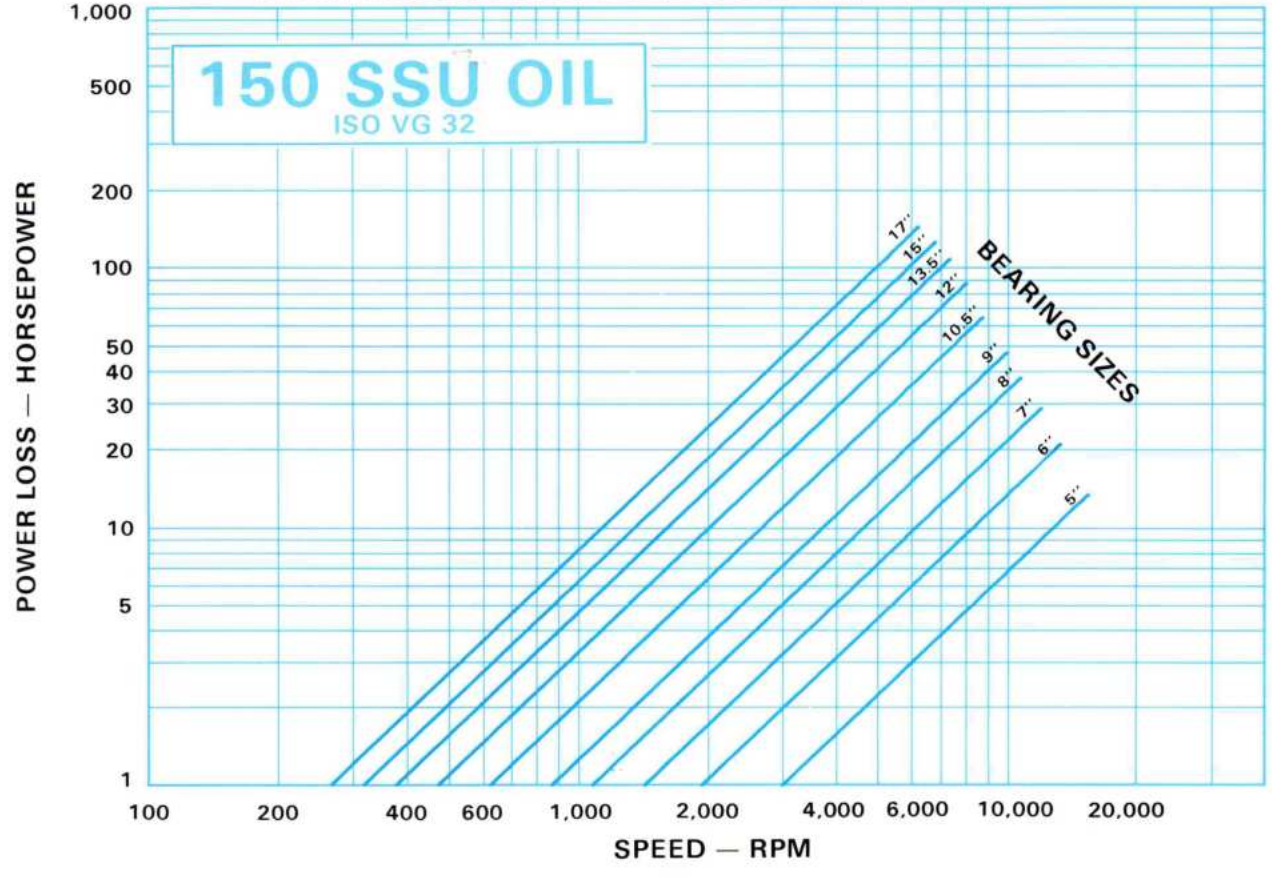


EXHIBIT 9

POWER LOSS
TILTING PAD THRUST BEARING (DOUBLE)
STANDARD BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

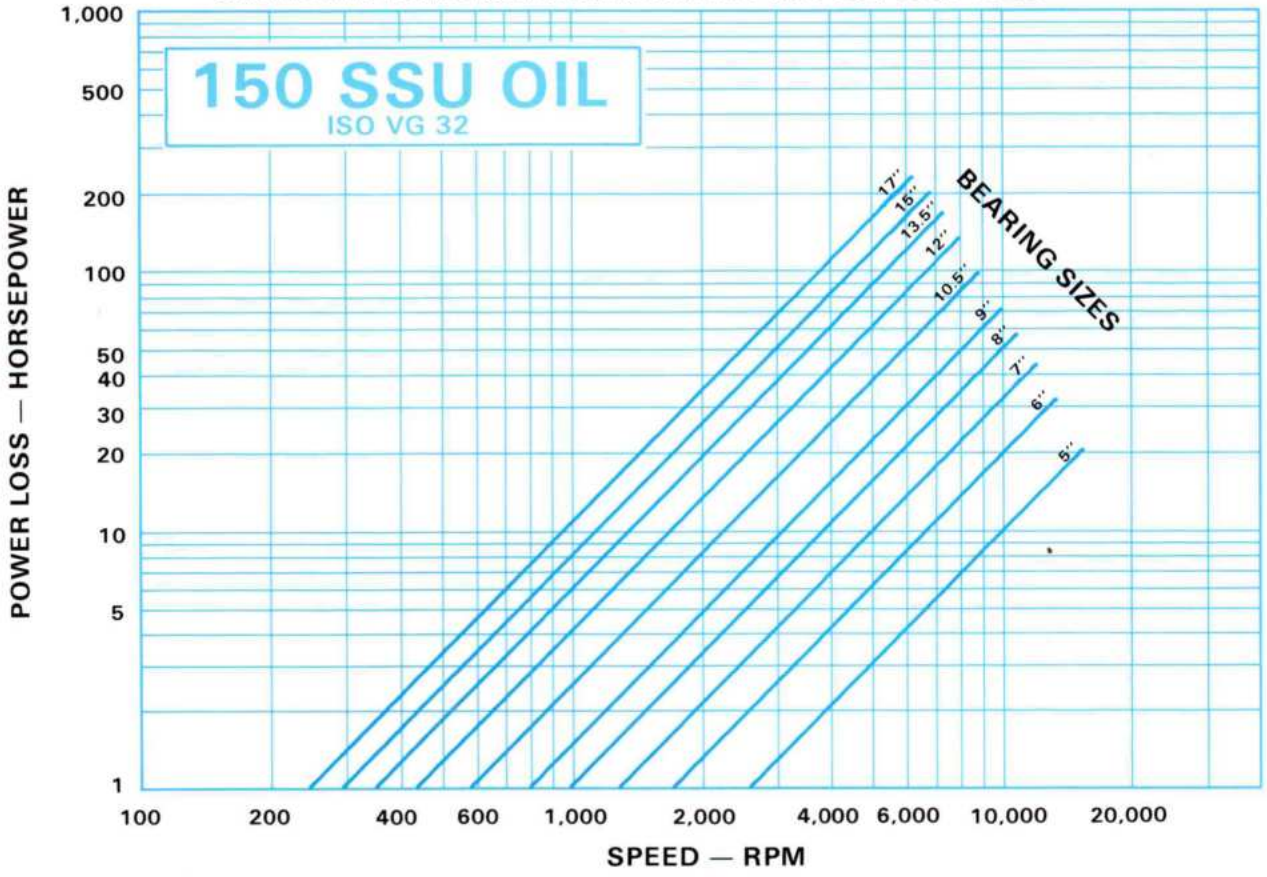


EXHIBIT 10

POWER LOSS
TILTING PAD THRUST BEARING (DOUBLE)
LARGE BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

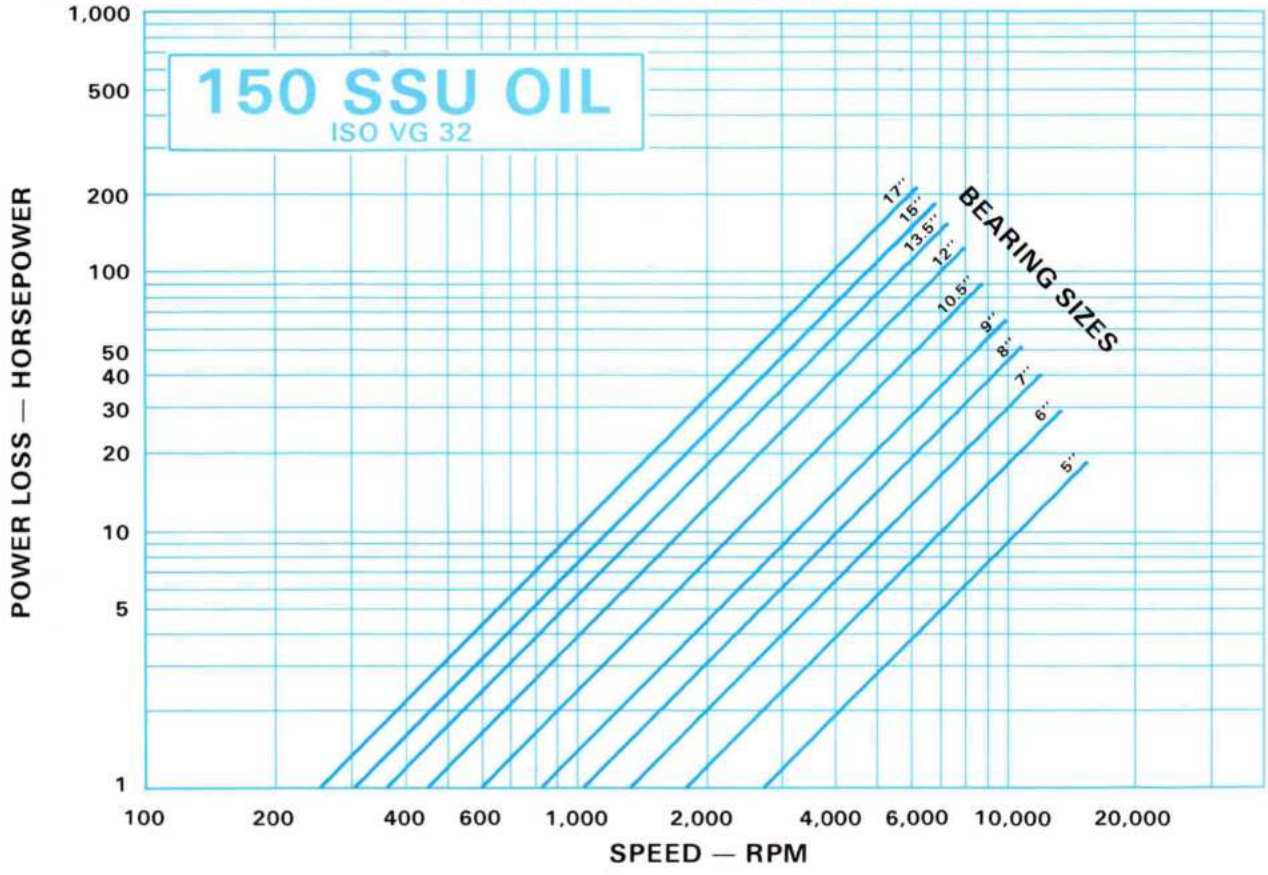


EXHIBIT 11

POWER LOSS
TILTING PAD THRUST BEARING (SINGLE)
STANDARD BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

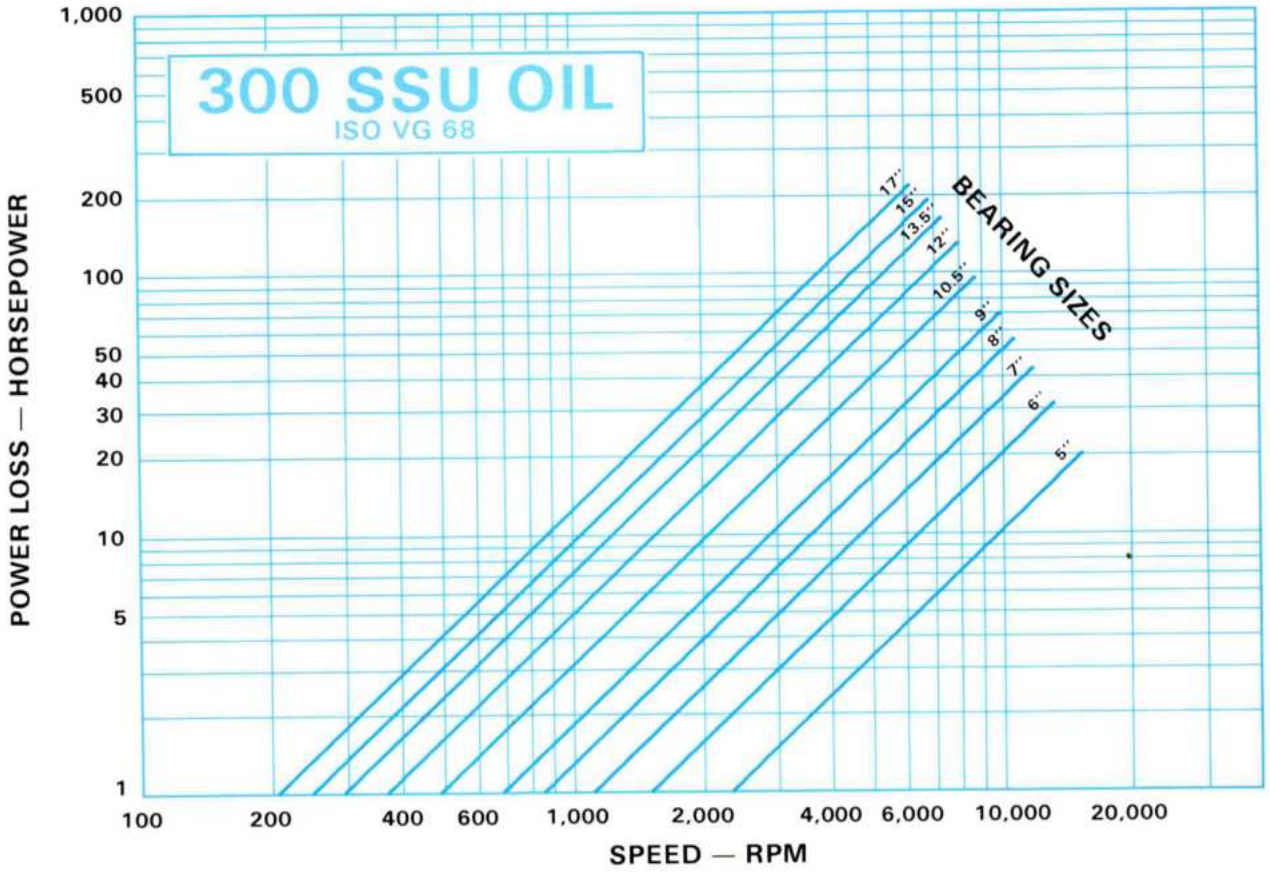


EXHIBIT 12

POWER LOSS
TILTING PAD THRUST BEARING (SINGLE)
LARGE BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

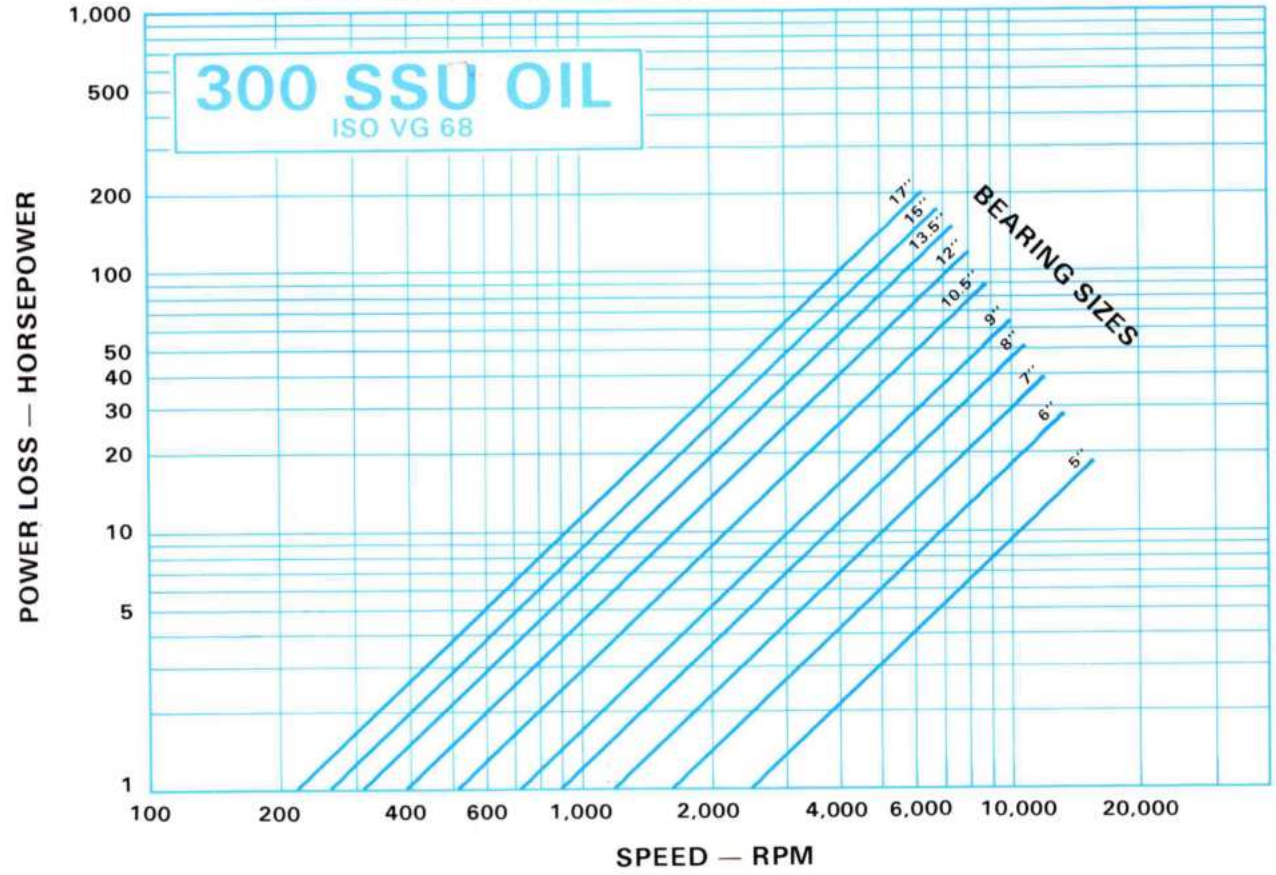


EXHIBIT 13

POWER LOSS
TILTING PAD THRUST BEARING (DOUBLE)
STANDARD BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

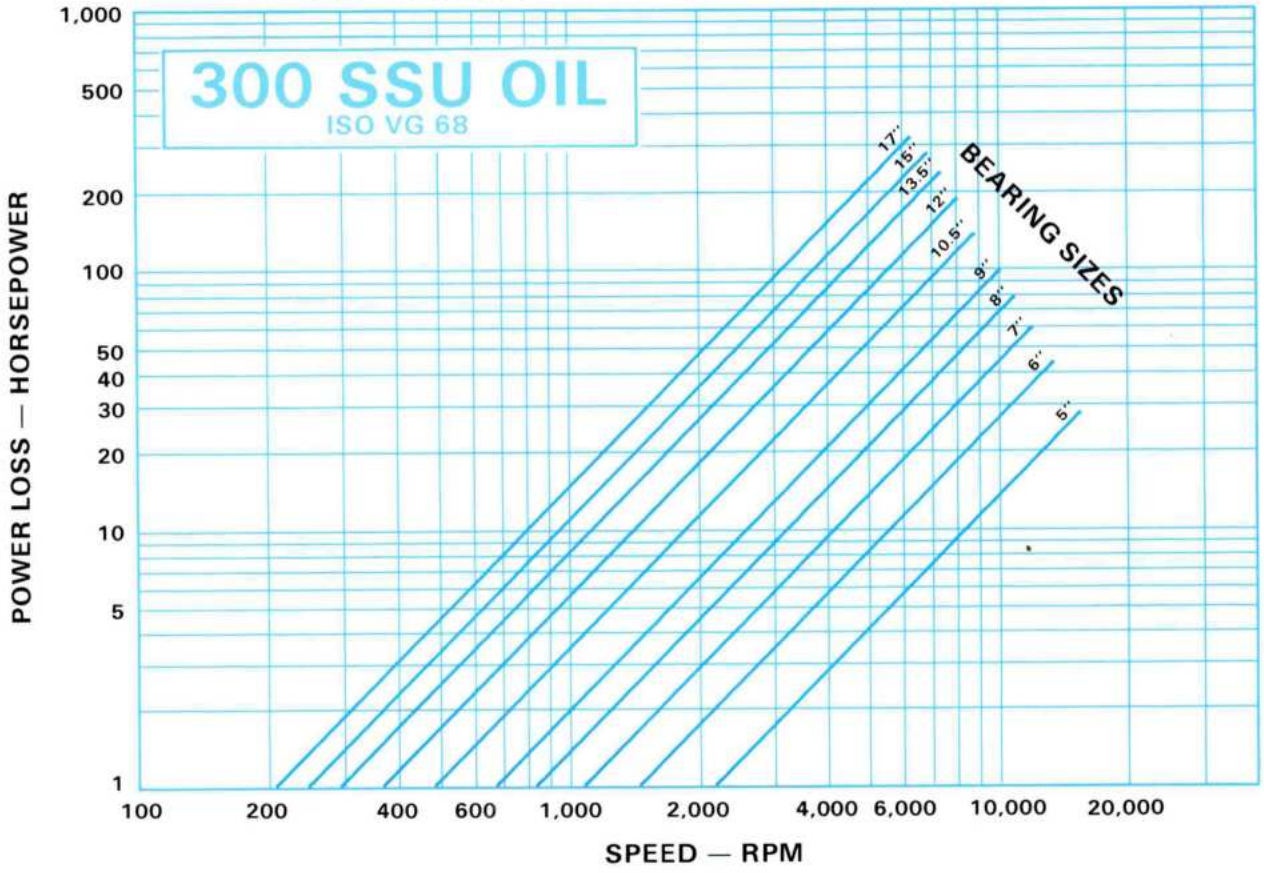


EXHIBIT 14

POWER LOSS
TILTING PAD THRUST BEARING (DOUBLE)
LARGE BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

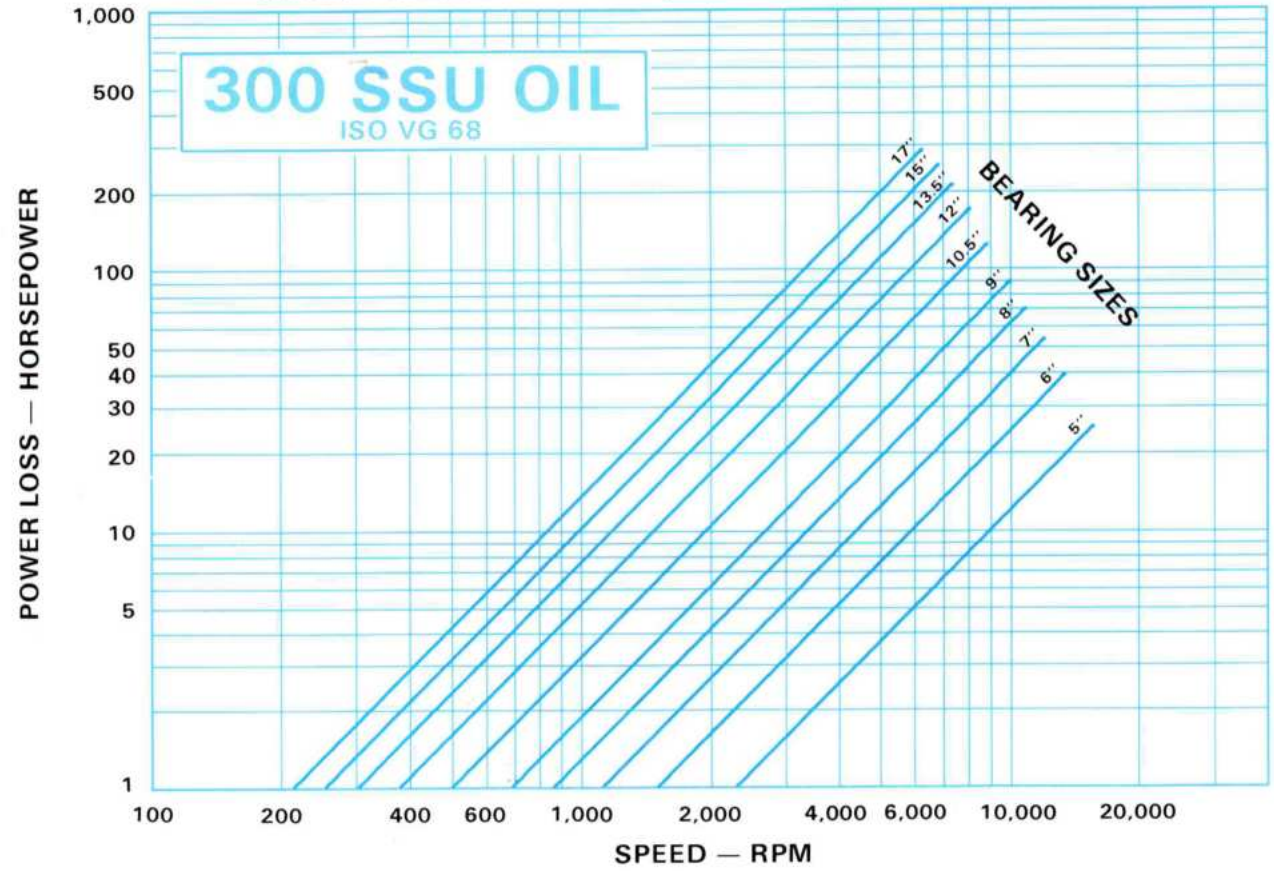


EXHIBIT 15

OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
STANDARD BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

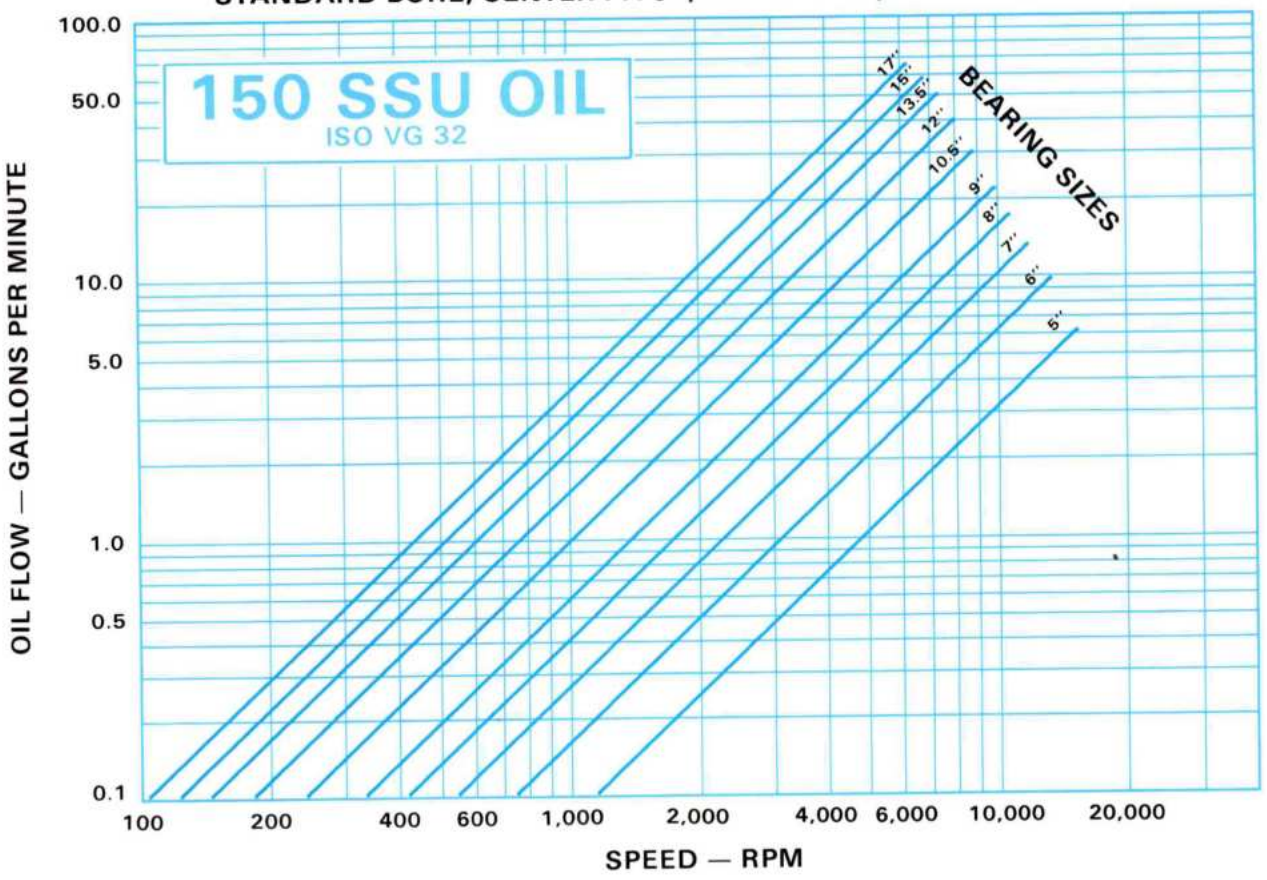


EXHIBIT 16

OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
LARGE BORE, CENTER PIVOT, 150 SSU OIL, 120F INLET

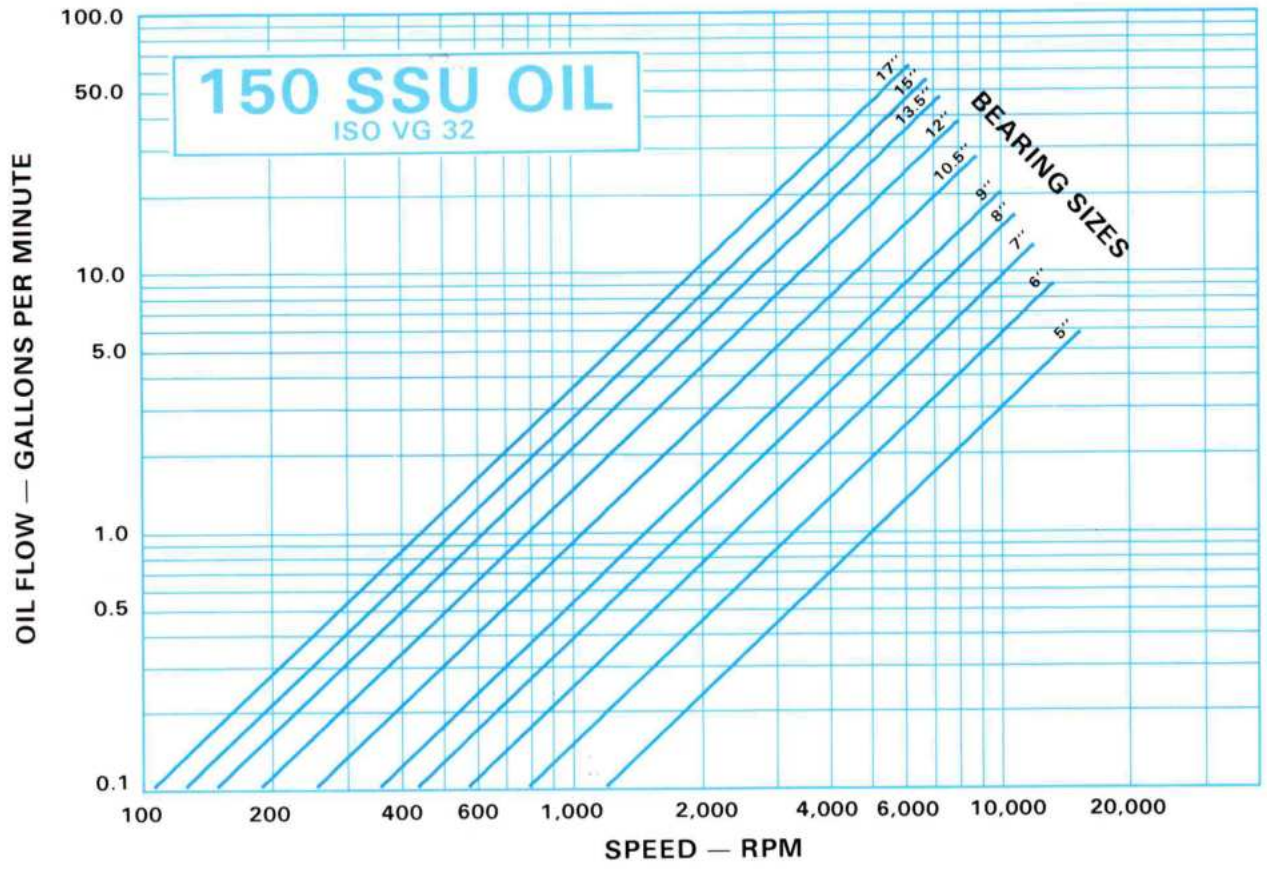


EXHIBIT 17

OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
STANDARD BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

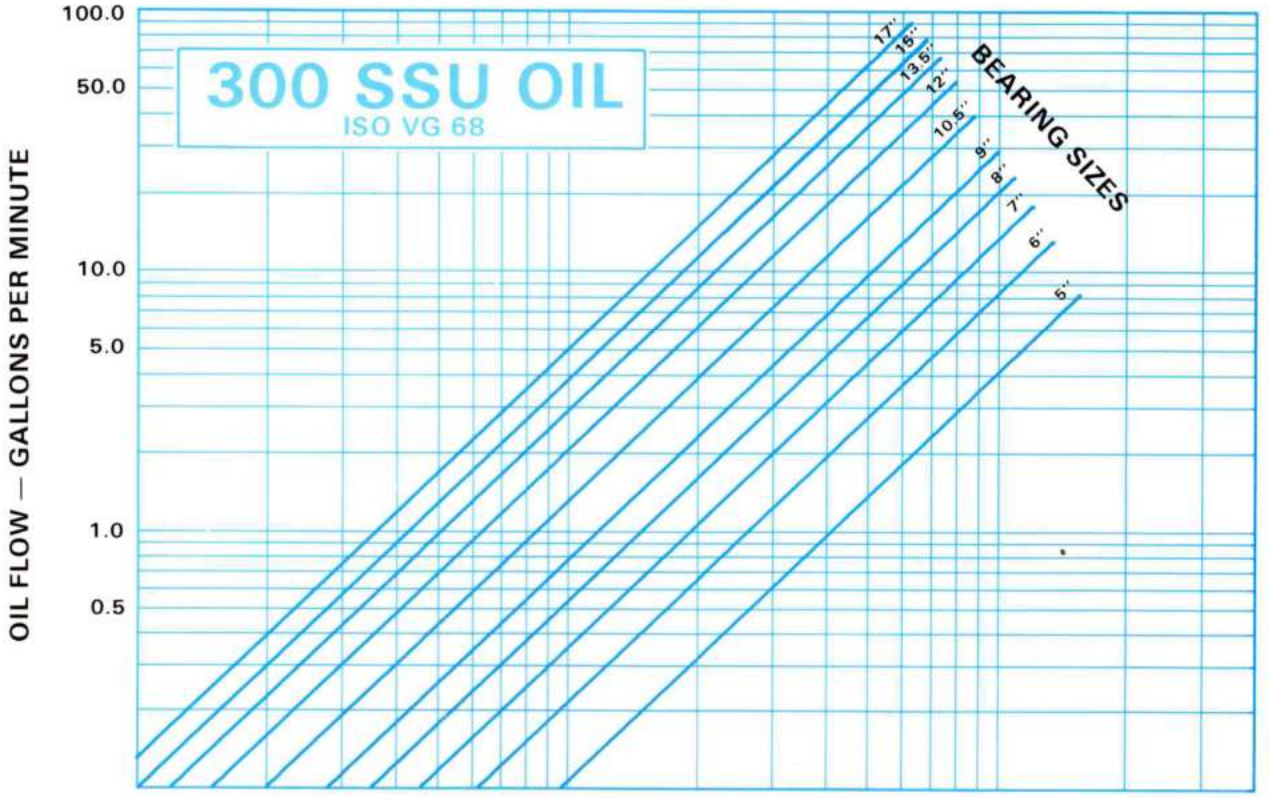


EXHIBIT 18

OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
LARGE BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

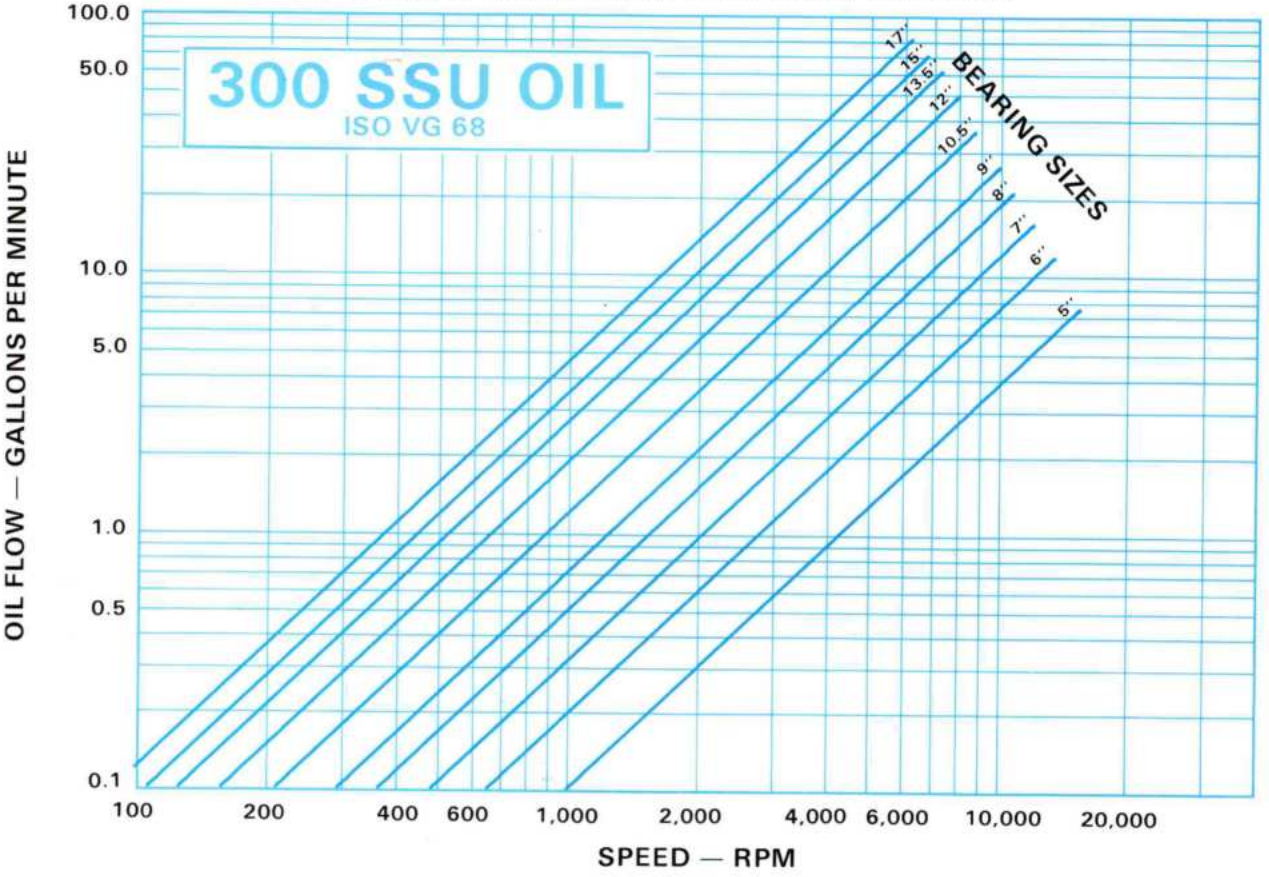


EXHIBIT 17

OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
STANDARD BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

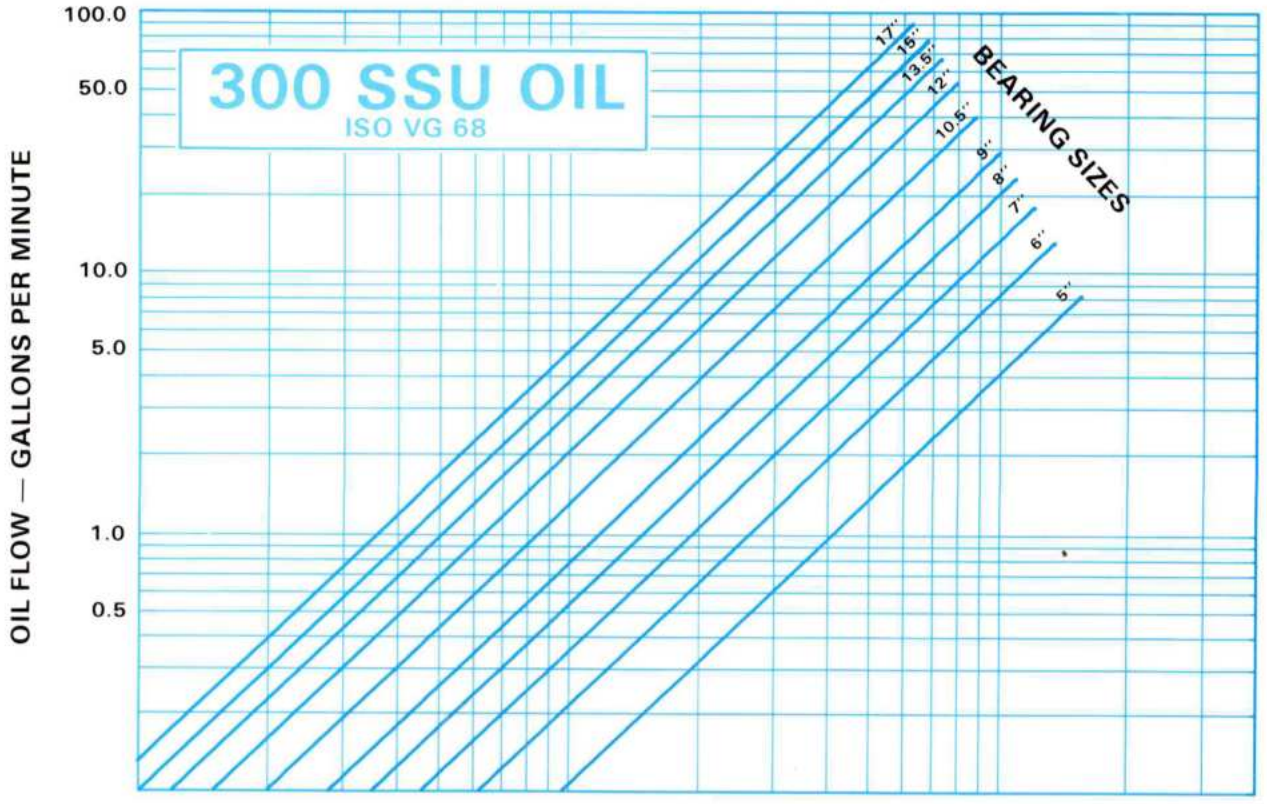
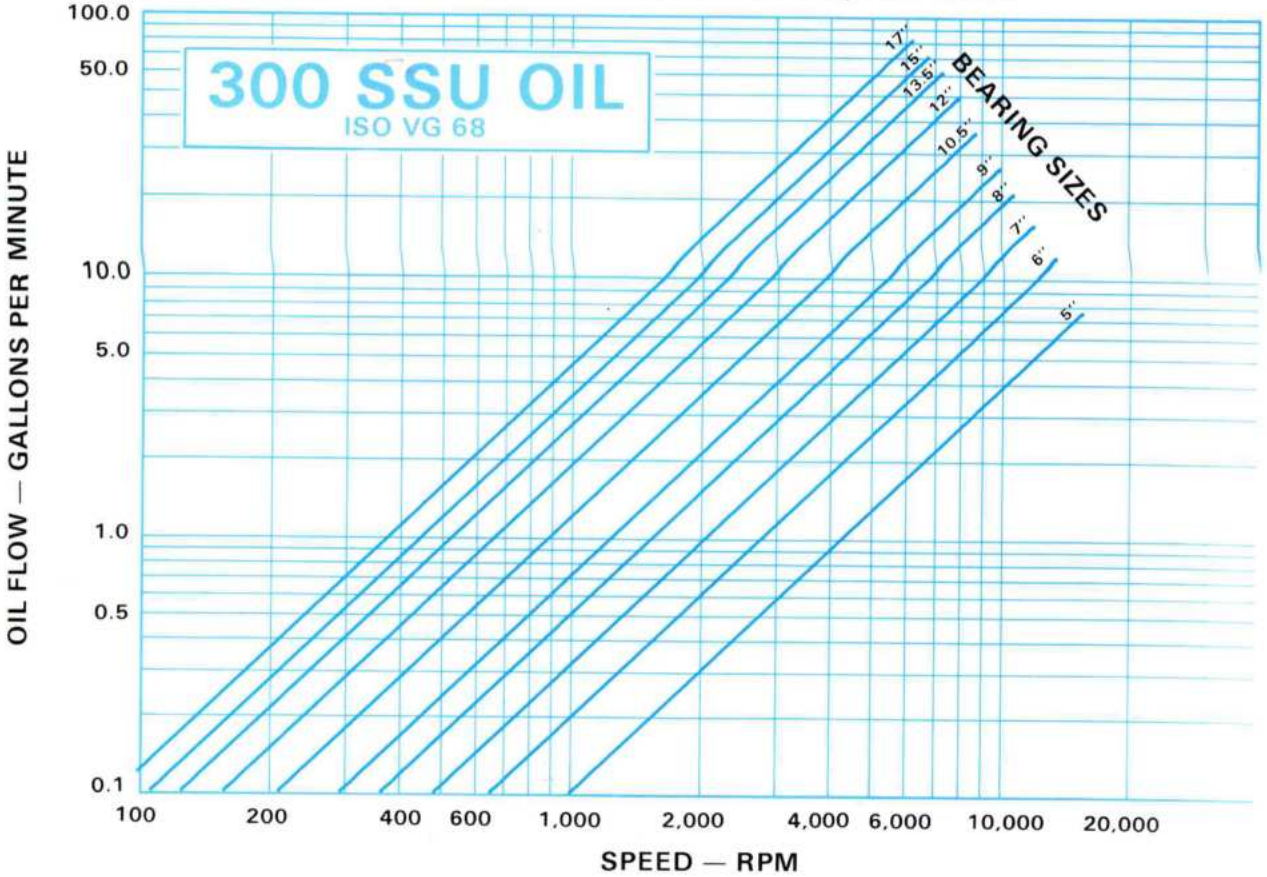


EXHIBIT 18

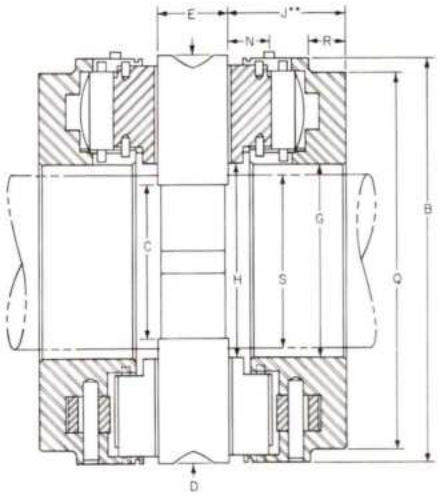
OIL FLOW
TILTING PAD THRUST BEARING (SINGLE)
LARGE BORE, CENTER PIVOT, 300 SSU OIL, 120F INLET

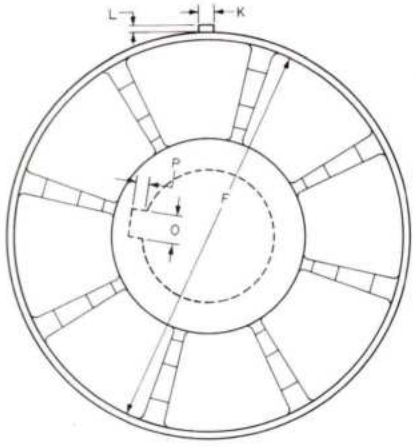


DIMENSIONAL DATA SHEETS

Bearing Type	Pad Qty.	Size Range	Pages
HYFILM	8	5" to 17"	28-29
HYFILM	9	5" to 17"	30-31
RETAINED PAD (Standard Bore)	8 or 6	5" to 17"	32-33
RETAINED PAD (Large Bore)	8 or 6	5" to 17"	34-35
LUG-TYPE DESIGN (Standard Bore)	8 or 6	5" to 17"	36-37
LUG-TYPE DESIGN (Large Bore)	8 or 6	5" to 17"	38-39
SELF-LEVELING DESIGN, Vertical	6	4" to 45"	40-43
NON-EQUALIZING DESIGN (Standard Bore)	6	4" to 17"	44-45
SPECIAL TILTING PAD DESIGN	4 to 16	3-1/2" to 54"	46-49

WAUKESHA
HyFilm -- EIGHT-PAD THRUST BEARINGS



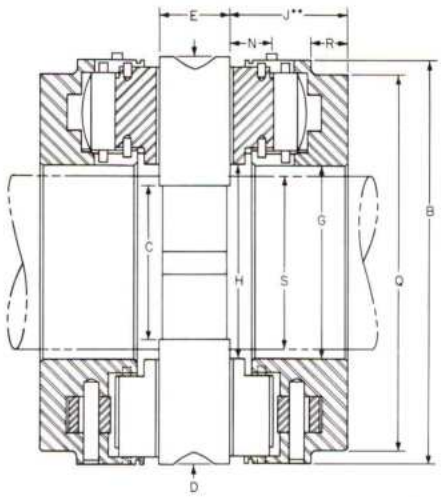


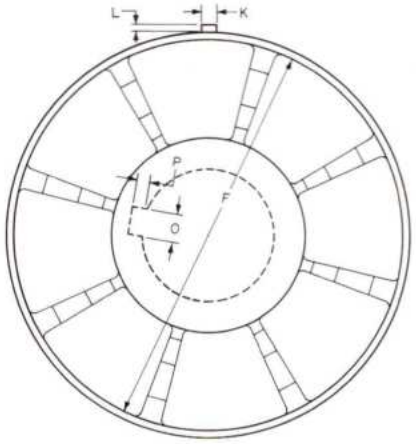
- 5" to 9" SIZES
- SELF-LEVELING
- SOLID OR SPLIT
- RETAINED PADS
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	605-880		606-880		607-880		608-880		609-880	
	DOUBLE W/COLLAR	605-881		606-881		607-881		608-881		609-881	
	SINGLE W/O COLLAR	605-800		606-800		607-800		608-800		609-800	
	SINGLE W/COLLAR	605-801		606-801		607-801		608-801		609-801	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	5	2.3	11	5.0	15	6.8	21	9.5	33	15.0
	DOUBLE W/O COLLAR	10	4.5	21	9.5	29	13.2	43	19.5	66	29.9
	COLLAR	4	1.8	7	3.2	12	5.4	17	7.7	22	10.0
	PADS (SET OF 8)	2	.9	4	1.8	6	2.7	9	4.1	13	5.9
A	AREA PER SIDE (SQ)*	12.5	81.0	18.0	116.0	24.5	158.0	32.0	206.0	40.5	261.0
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE	1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN	5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS	.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.	5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE	2.5	63.5	3.0	76.2	3.5	88.9	4.0	101.6	4.5	114.3
H	PAD BORE	2.5	63.5	3.0	76.2	3.5	88.9	4.0	101.6	4.5	114.3
J1	ASSEMBLY HT - STD.**	1.75	44.5	2.0	50.8	2.25	57.2	2.56	65.0	2.75	69.9
J2	ASSEMBLY HT - ALT.**	1.75	44.5	2.06	52.3	2.38	60.5	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**	1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	ANTI-ROTATION PIN DIAMETER	.312	7.9	.375	9.5	.375	9.5	.437	11.1	.437	11.1
L	PIN HEIGHT	.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
N	COLLAR TO PIN	.94	23.9	1.06	26.9	1.19	30.2	1.31	33.3	1.44	36.6
O	COLLAR KEY WIDTH	.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH	.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER	5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT	.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE	2.25	57.2	2.75	69.9	3.25	82.6	3.75	95.3	4.25	108.0

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.
--- AREA EQUIVALENT TO 6-PAD STANDARD BORE.
** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
HyFilm -- EIGHT-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- SELF-LEVELING
- SOLID OR SPLIT
- RETAINED PADS
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

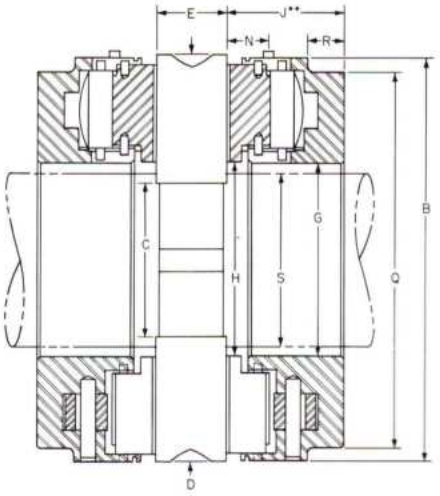
THRUST BEARING SIZES		10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	610-880		612-880		613-880		615-880		617-880	
	DOUBLE W/COLLAR	610-881		612-881		613-881		615-881		617-881	
	SINGLE W/O COLLAR	610-800		612-800		613-800		615-800		617-800	
	SINGLE W/COLLAR	610-801		612-801		613-801		615-801		617-801	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	46	20.9	68	30.8	95	43.1	132	59.9	189	85.7
	DOUBLE W/O COLLAR	93	42.2	135	61.2	190	86.2	265	120.2	379	171.9
	COLLAR	38	17.2	51	23.1	74	33.6	103	46.7	154	69.9
	PADS (SET OF 8)	21	9.5	27	12.2	37	16.8	50	22.7	73	33.1
A	AREA PER SIDE (SQ)*	55.1	356.0	72.0	465.0	91.1	588.0	112.5	725.9	144.5	932.3
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE	4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN	10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS	1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.	10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE	5.25	133.4	6.0	152.4	6.75	171.5	7.5	190.5	8.5	215.9
H	PAD BORE	5.25	133.4	6.0	152.4	6.75	171.5	7.5	190.5	8.5	215.9
J1	ASSEMBLY HT - STD.**	3.13	79.5	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**	3.38	85.9	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**	2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	ANTI-ROTATION PIN DIAMETER	.500	12.7	.500	12.7	.625	15.9	.625	15.9	.750	19.1
L	PIN HEIGHT	.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
N	COLLAR TO PIN	.62	15.8	1.81	46.0	2.06	52.3	2.25	57.2	2.62	66.6
O	COLLAR KEY WIDTH	.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH	.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER	10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT	.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE	4.88	124.0	5.63	143.0	6.38	162.1	7.0	177.8	8.0	203.2

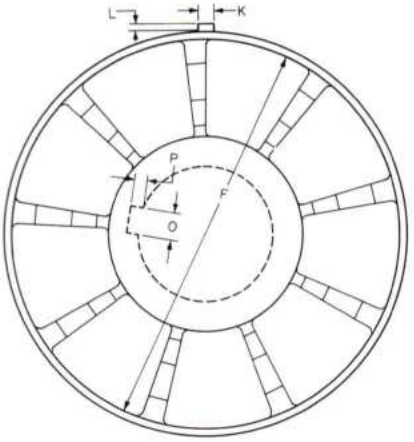
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS. --- AREA EQUIVALENT TO 6-PAD STANDARD BORE.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
HyFilm -- NINE-PAD THRUST BEARINGS





- 5" to 9" SIZES
- SELF-LEVELING
- SOLID OR SPLIT
- RETAINED PADS
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

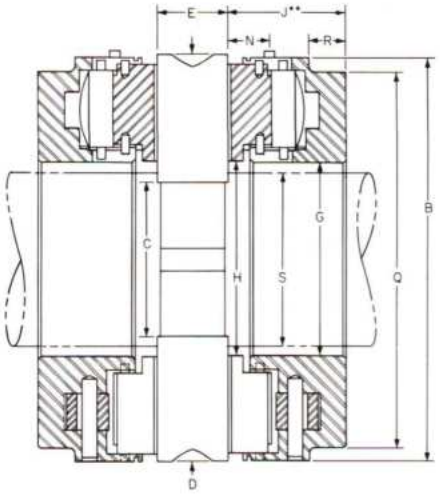
THRUST BEARING SIZES		5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	605-990		606-990		607-990		608-990		609-990	
	DOUBLE W/COLLAR	605-991		606-991		607-991		608-991		609-991	
	SINGLE W/O COLLAR	605-900		606-900		607-900		608-900		609-900	
	SINGLE W/COLLAR	605-901		606-901		607-901		608-901		609-901	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	5	2.3	11	5.0	15	6.8	21	9.5	33	15.0
	DOUBLE W/O COLLAR	10	4.5	21	9.5	29	13.2	43	19.5	66	29.9
	COLLAR	4	1.8	7	3.2	12	5.4	17	7.7	22	10.0
	PADS (SET OF 9)	2	.9	4	1.8	6	2.7	9	4.1	13	5.9
A	AREA PER SIDE (SQ)*	11.6	74.8	16.7	107.8	23.0	148.4	29.9	192.9	37.8	243.8
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE	1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN	5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS	.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.	5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE	2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
H	PAD BORE	2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
J1	ASSEMBLY HT - STD.**	1.75	44.5	2.0	50.8	2.25	57.2	2.56	65.0	2.75	69.9
J2	ASSEMBLY HT - ALT.**	1.75	44.5	2.06	52.3	2.38	60.5	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**	1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	ANTI-ROTATION PIN DIAMETER	.312	7.9	.375	9.5	.375	9.5	.437	11.1	.437	11.1
L	PIN HEIGHT	.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
N	COLLAR TO PIN	.94	23.9	1.06	26.9	1.19	30.2	1.31	33.3	1.44	36.6
O	COLLAR KEY WIDTH	.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH	.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER	5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT	.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE	2.50	63.5	3.06	77.7	3.56	90.4	4.13	104.9	4.69	119.1

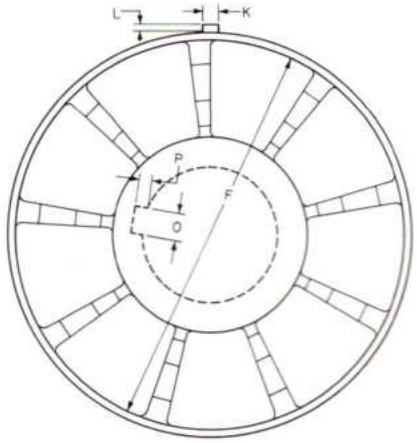
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS. --- AREA EQUIVALENT TO 6-PAD LARGE BORE.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
HyFilm -- NINE-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- SELF-LEVELING
- SOLID OR SPLIT
- RETAINED PADS
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

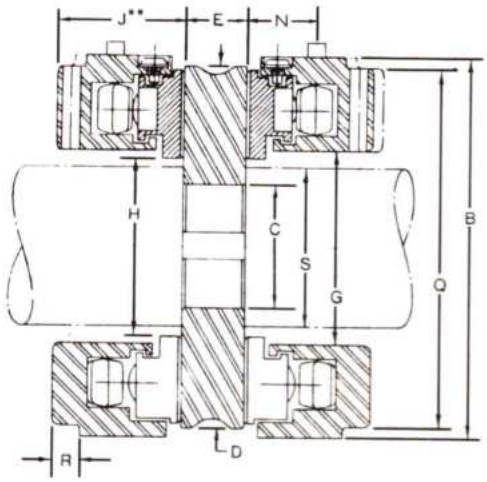
THRUST BEARING SIZES		10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	610-990		612-990		613-990		615-990		617-990	
	DOUBLE W/COLLAR	610-991		612-991		613-991		615-991		617-991	
	SINGLE W/O COLLAR	610-900		612-900		613-900		615-900		617-900	
	SINGLE W/COLLAR	610-901		612-901		613-901		615-901		617-901	
		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
WEIGHTS	SINGLE W/O COLLAR	46	20.9	68	30.8	95	43.1	132	59.9	189	85.7
	DOUBLE W/O COLLAR	93	42.2	135	61.2	190	86.2	265	120.2	379	171.9
	COLLAR	38	17.2	51	23.1	74	33.6	103	46.7	154	69.9
	PADS (SET OF 9)	21	9.5	27	12.2	37	16.8	50	22.7	73	33.1
A	AREA PER SIDE (SQ)*	51.5	332.3	66.8	431.0	84.8	547.1	104.7	675.0	134.4	867.0
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE	4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN	10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS	1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.	10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE	5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE	5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
J1	ASSEMBLY HT - STD.**	3.13	79.5	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**	3.38	85.9	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**	2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	ANTI-ROTATION PIN DIAMETER	.500	12.7	.500	12.7	.625	15.9	.625	15.9	.750	19.1
L	PIN HEIGHT	.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
N	COLLAR TO PIN	.62	15.8	1.81	46.0	2.06	52.3	2.25	57.2	2.62	66.6
O	COLLAR KEY WIDTH	.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH	.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER	10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT	.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE	5.38	136.7	6.25	158.8	7.06	162.1	7.75	196.9	8.88	225.6

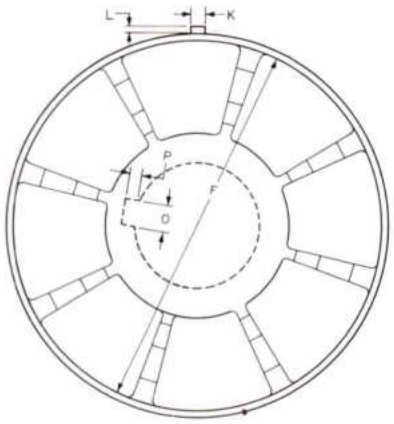
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS. --- AREA EQUIVALENT TO 6-PAD LARGE BORE.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
RETAINED PAD DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 5" to 9" SIZES
- STANDARD BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

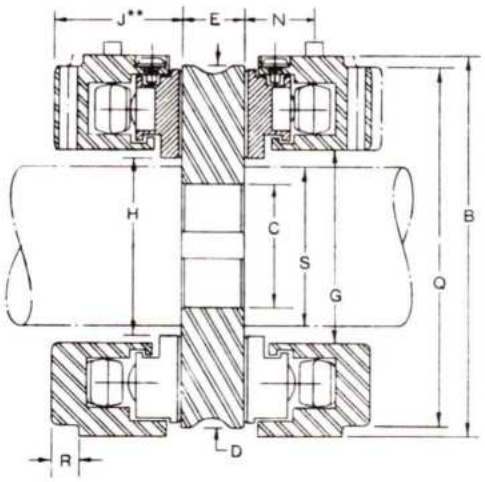
THRUST BEARING SIZES			5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	305-880		306-880		307-880		308-880		309-880	
	DOUBLE W/COLLAR		305-881		306-881		307-881		308-881		309-881	
	SINGLE W/O COLLAR		305-800		306-800		307-800		308-800		309-800	
	SINGLE W/COLLAR		305-801		306-801		307-801		308-801		309-801	
	DOUBLE W/O COLLAR	6 PAD	305-660		306-660		307-660		308-660		309-660	
	DOUBLE W/COLLAR		305-661		306-661		307-661		308-661		309-661	
	SINGLE W/O COLLAR		305-600		306-600		307-600		308-600		309-600	
	SINGLE W/COLLAR		305-601		306-601		307-601		308-601		309-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		5	2.3	10	4.5	14	6.4	20	9.1	31	14.1
	DOUBLE W/O COLLAR		10	4.5	20	9.1	28	12.7	41	18.6	63	28.6
	COLLAR		4	1.8	7	3.2	11	5.0	16	7.3	21	9.5
	PADS (SET 8 OR 6)		2	.9	4	1.8	6	2.7	9	4.1	12	5.4
A	AREA PER SIDE (SQ)*		12.5	81.0	18.0	116.0	24.5	158.0	32.0	206.0	40.5	261.0
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE		1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN		5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.		5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
H	PAD BORE		2.50	63.5	3.0	76.2	3.50	88.9	4.0	101.6	4.50	114.3
J1	ASSEMBLY HT - STD.**		1.75	44.5	2.0	50.8	2.25	57.2	2.56	65.0	2.75	69.9
J2	ASSEMBLY HT - ALT.**		1.75	44.5	2.06	52.3	2.38	60.5	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**		1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	ANTI-ROTATION PIN DIAMETER		.312	7.9	.375	9.5	.375	9.5	.438	11.1	.438	11.1
L	PIN HEIGHT		.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
N	COLLAR TO PIN		1.06	26.9	1.06	26.9	1.22	31.0	1.38	35.1	1.56	39.6
O	COLLAR KEY WIDTH		.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH		.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER		5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT		.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE		2.25	57.2	2.75	69.9	3.25	82.6	3.75	95.3	4.25	108.0

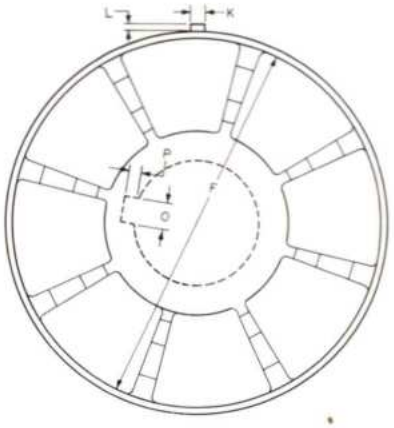
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
RETAINED PAD DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- STANDARD BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

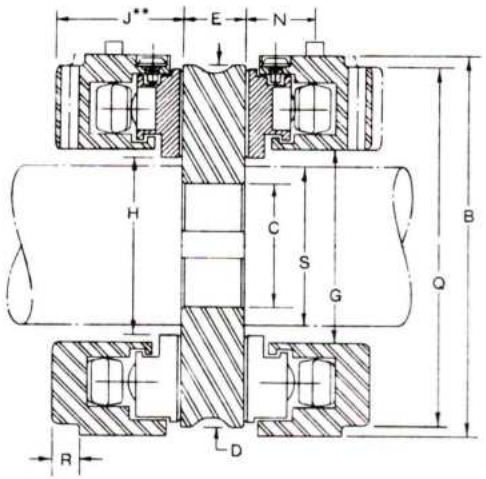
THRUST BEARING SIZES			10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	310-880		312-880		313-880		315-880		317-880	
	DOUBLE W/COLLAR		310-881		312-881		313-881		315-881		317-881	
	SINGLE W/O COLLAR		310-800		312-800		313-800		315-800		317-800	
	SINGLE W/COLLAR		310-801		312-801		313-801		315-801		317-801	
	DOUBLE W/O COLLAR	6 PAD	310-660		312-660		313-660		315-660		317-660	
	DOUBLE W/COLLAR		310-661		312-661		313-661		315-661		317-661	
	SINGLE W/O COLLAR		310-600		312-600		313-600		315-600		317-600	
	SINGLE W/COLLAR		310-601		312-601		313-601		315-601		317-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		44	20.0	65	29.5	90	40.8	125	56.7	179	81.2
	DOUBLE W/O COLLAR		89	40.4	129	58.5	181	82.1	251	113.9	359	162.8
	COLLAR		36	16.3	49	22.2	70	31.8	97	44.0	146	66.2
	PADS (SET 8 OR 6)		20	9.1	26	11.8	35	15.9	47	21.3	69	31.3
A	AREA PER SIDE (SQ)*		55.1	356.0	72.0	465.0	91.1	588.0	112.5	725.9	144.5	932.5
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE		4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN		10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS		1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.		10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE		5.25	133.4	6.0	152.4	6.75	171.5	7.50	190.5	8.50	215.9
J1	ASSEMBLY HT - STD.**		3.13	79.5	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**		3.38	85.9	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**		2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	ANTI-ROTATION PIN DIAMETER		.500	12.7	.625	15.9	.625	15.9	.625	15.9	.750	19.1
L	PIN HEIGHT		.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
N	COLLAR TO PIN		1.59	40.4	1.88	47.8	2.06	52.3	2.12	53.9	2.62	66.5
O	COLLAR KEY WIDTH		.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH		.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER		10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT		.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE		4.88	124.0	5.63	143.0	6.38	162.1	7.0	177.8	8.0	203.2

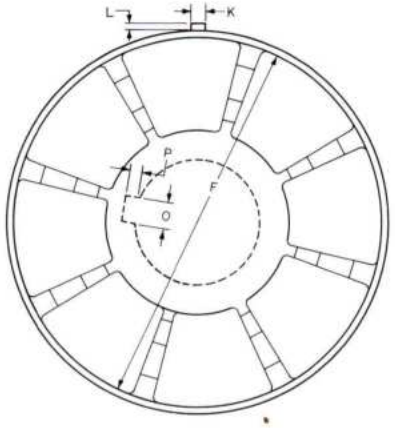
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
RETAINED PAD DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 5" to 9" SIZES
- LARGE BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

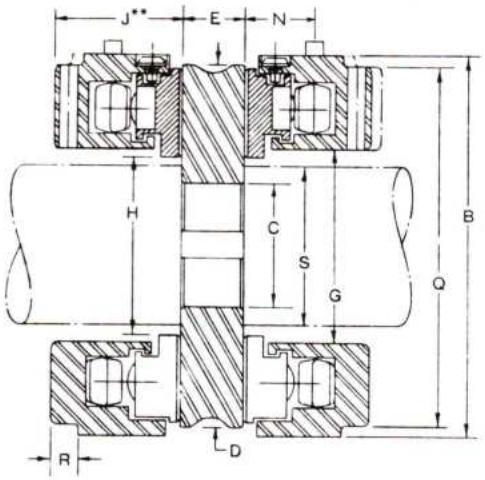
THRUST BEARING SIZES			5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	305-880		306-880		307-880		308-880		309-880	
	DOUBLE W/COLLAR		305-881		306-881		307-881		308-881		309-881	
	SINGLE W/O COLLAR		305-800		306-800		307-800		308-800		309-800	
	SINGLE W/COLLAR		305-801		306-801		307-801		308-801		309-801	
	DOUBLE W/O COLLAR	6 PAD	305-660		306-660		307-660		308-660		309-660	
	DOUBLE W/COLLAR		305-661		306-661		307-661		308-661		309-661	
	SINGLE W/O COLLAR		305-600		306-600		307-600		308-600		309-600	
	SINGLE W/COLLAR		305-601		306-601		307-601		308-601		309-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		5	2.3	10	4.5	14	6.4	20	9.1	31	14.1
	DOUBLE W/O COLLAR		10	4.5	20	9.1	28	12.7	41	18.6	63	28.6
	COLLAR		4	1.8	7	3.2	11	5.0	16	7.3	21	9.5
	PADS (SET 8 OR 6)		2	.9	4	1.8	6	2.7	9	4.1	12	5.4
A	AREA PER SIDE (SQ)*		11.6	74.8	16.7	107.8	23.0	148.4	29.9	192.9	37.8	243.8
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE		1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN		5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.		5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
H	PAD BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
J1	ASSEMBLY HT - STD.**		1.75	44.5	2.0	50.8	2.25	57.2	2.56	65.0	2.75	69.9
J2	ASSEMBLY HT - ALT.**		1.75	44.5	2.06	52.3	2.38	60.5	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**		1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	ANTI-ROTATION PIN DIAMETER		.312	7.9	.375	9.5	.375	9.5	.438	11.1	.438	11.1
L	PIN HEIGHT		.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
N	COLLAR TO PIN		1.06	26.9	1.06	26.9	1.22	31.0	1.38	35.1	1.56	39.6
O	COLLAR KEY WIDTH		.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH		.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER		5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT		.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE		2.50	63.5	3.06	77.7	3.56	90.4	4.12	104.9	4.69	119.1

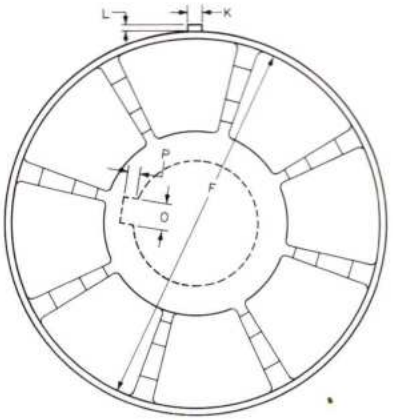
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
RETAINED PAD DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- LARGE BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

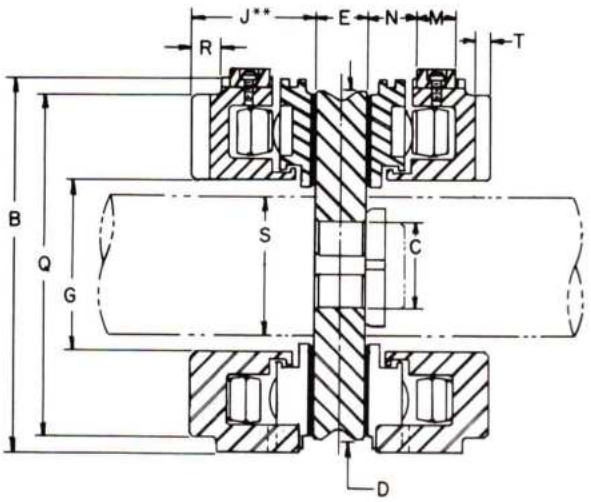
THRUST BEARING SIZES			10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	310-880		312-880		313-880		315-880		317-880	
	DOUBLE W/COLLAR		310-881		312-881		313-881		315-881		317-881	
	SINGLE W/O COLLAR		310-800		312-800		313-800		315-800		317-800	
	SINGLE W/COLLAR		310-801		312-801		313-801		315-801		317-801	
	DOUBLE W/O COLLAR	6 PAD	310-660		312-660		313-660		315-660		317-660	
	DOUBLE W/COLLAR		310-661		312-661		313-661		315-661		317-661	
	SINGLE W/O COLLAR		310-600		312-600		313-600		315-600		317-600	
	SINGLE W/COLLAR		310-601		312-601		313-601		315-601		317-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		44	20.0	65	29.5	90	40.8	125	56.7	179	81.2
	DOUBLE W/O COLLAR		89	40.4	129	58.5	181	82.1	251	113.9	359	162.8
	COLLAR		36	16.3	49	22.2	70	31.8	97	44.0	146	66.2
	PADS (SET 8 OR 6)		20	9.1	26	11.8	35	15.9	47	21.3	69	31.3
A	AREA PER SIDE (SQ)*		51.5	332.3	66.8	431.0	84.8	547.1	104.7	675.0	134.4	867.0
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE		4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN		10.69	271.4	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS		1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.		10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
J1	ASSEMBLY HT - STD.**		3.13	79.5	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**		3.38	85.9	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**		2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	ANTI-ROTATION PIN DIAMETER		.500	12.7	.625	15.9	.625	15.9	.625	15.9	.750	19.1
L	PIN HEIGHT		.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
N	COLLAR TO PIN		1.59	40.4	1.88	47.8	2.06	52.3	2.12	53.8	2.62	66.6
O	COLLAR KEY WIDTH		.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH		.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER		10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT		.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE		5.38	136.7	6.25	158.8	7.06	162.1	7.75	196.9	8.88	225.6

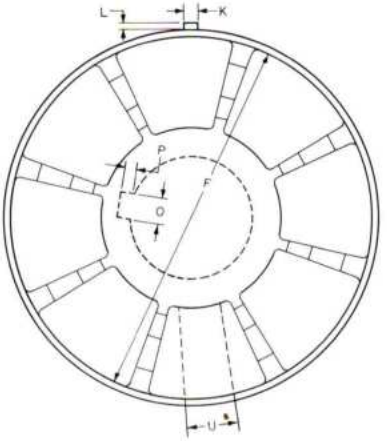
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
LUG-TYPE DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS



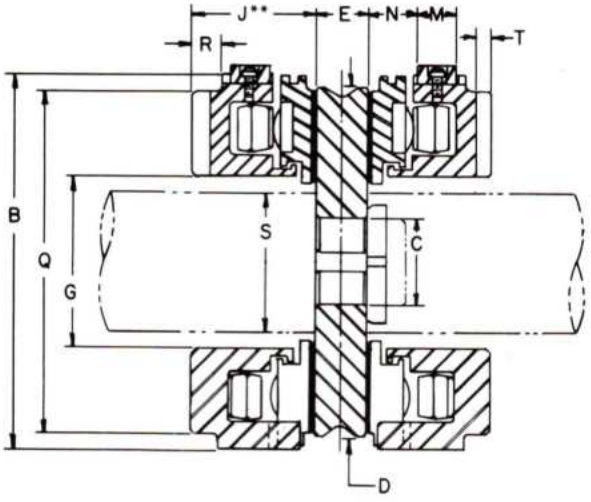


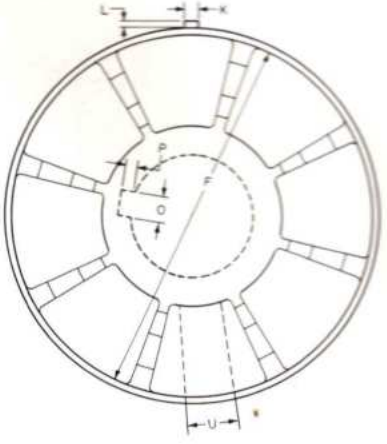
- 5" to 9" SIZES
- STANDARD BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES			5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	005-880		006-880		007-880		008-880		009-880	
	DOUBLE W/COLLAR		005-881		006-881		007-881		008-881		009-881	
	SINGLE W/O COLLAR		005-800		006-800		007-800		008-800		009-800	
	SINGLE W/COLLAR		005-801		006-801		007-801		008-801		009-801	
	DOUBLE W/O COLLAR	6 PAD	005-660		006-660		007-660		008-660		009-660	
	DOUBLE W/COLLAR		005-661		006-661		007-661		008-661		009-661	
	SINGLE W/O COLLAR		005-600		006-600		007-600		008-600		009-600	
	SINGLE W/COLLAR		005-601		006-601		007-601		008-601		009-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		5	2.3	10	4.5	14	6.4	20	9.1	31	14.1
	DOUBLE W/O COLLAR		10	4.5	20	9.1	28	12.7	41	18.6	63	28.6
	COLLAR		4	1.8	7	3.2	11	5.0	16	7.3	21	9.5
	PADS (SET 8 OR 6)		2	.9	4	1.8	6	2.7	9	4.1	12	5.4
A	AREA PER SIDE (SQ)*		12.5	81.0	18.0	116.0	24.5	158.0	32.0	206.0	40.5	261.0
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE		1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN		5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.		5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
H	PAD BORE		2.50	63.5	3.0	76.2	3.50	88.9	4.0	101.6	4.50	114.3
J1	ASSEMBLY HT - STD.**		1.75	44.4	2.0	50.8	2.25	57.2	2.56	65.1	2.75	69.9
J2	ASSEMBLY HT - ALT.**		1.75	44.4	2.06	52.4	2.38	60.3	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**		1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	CASING KEY WIDTH		.31	7.9	.38	9.7	.38	9.7	.44	11.2	.44	11.2
L	CASING KEY HEIGHT		.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
M	CASING KEY LENGTH		.50	12.7	.63	16.0	.63	16.0	.69	17.5	.75	19.1
N	COLLAR TO KEY		.69	17.5	.75	19.1	.88	22.4	1.00	25.4	1.50	38.1
O	COLLAR KEY WIDTH		.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH		.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER		5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT		.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE		2.25	57.2	2.75	69.9	3.25	82.6	3.75	95.3	4.25	108.0
T	OIL INLET HEIGHT		.28	7.1	.31	7.9	.31	7.9	.38	9.7	.38	9.7
U	OIL INLET WIDTH		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.
** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
LUG-TYPE DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- STANDARD BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

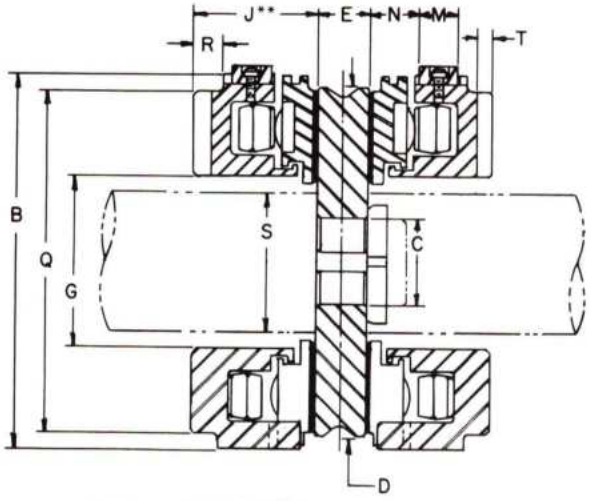
THRUST BEARING SIZES			10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	010-880		012-880		013-880		015-880		017-880	
	DOUBLE W/COLLAR	8 PAD	010-881		012-881		013-881		015-881		017-881	
	SINGLE W/O COLLAR	8 PAD	010-800		012-800		013-800		015-800		017-800	
	SINGLE W/COLLAR	8 PAD	010-801		012-801		013-801		015-801		017-801	
	DOUBLE W/O COLLAR	6 PAD	010-660		012-660		013-660		015-660		017-660	
	DOUBLE W/COLLAR	6 PAD	010-661		012-661		013-661		015-661		017-661	
	SINGLE W/O COLLAR	6 PAD	010-600		012-600		013-600		015-600		017-600	
	SINGLE W/COLLAR	6 PAD	010-601		012-601		013-601		015-601		017-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		44	20.0	65	29.5	90	40.8	125	56.7	179	81.2
	DOUBLE W/O COLLAR		89	40.4	129	58.5	181	82.1	251	113.9	359	162.8
	COLLAR		36	16.3	49	22.2	70	31.8	97	44.0	146	66.2
	PADS (SET 8 OR 6)		20	9.1	26	11.8	35	15.9	47	21.3	69	31.3
A	AREA PER SIDE (SQ)*		55.1	356.0	72.0	465.0	91.1	588.0	112.5	725.9	144.5	932.3
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE		4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN		10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS		1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.		10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE		5.25	133.4	6.0	152.4	6.75	171.5	7.50	190.5	8.50	215.9
J1	ASSEMBLY HT - STD.**		3.13	79.4	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**		3.38	85.7	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**		2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	CASING KEY WIDTH		.50	12.7	.56	14.2	.63	16.0	.69	17.5	.75	19.1
L	CASING KEY HEIGHT		.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
M	CASING KEY LENGTH		.88	22.4	1.00	25.4	1.25	31.8	1.38	35.1	1.50	38.1
N	COLLAR TO KEY		1.19	30.2	1.31	33.3	1.50	38.1	1.56	39.6	1.75	44.5
O	COLLAR KEY WIDTH		.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH		.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER		10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT		.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE		4.88	124.0	5.63	143.0	6.38	162.1	7.0	177.8	8.0	203.2
T	OIL INLET HEIGHT		.44	11.2	.50	12.7	.63	16.0	.69	17.5	.88	22.4
U	OIL INLET WIDTH		1.63	41.4	1.75	44.5	2.00	50.8	2.25	57.2	2.50	63.5

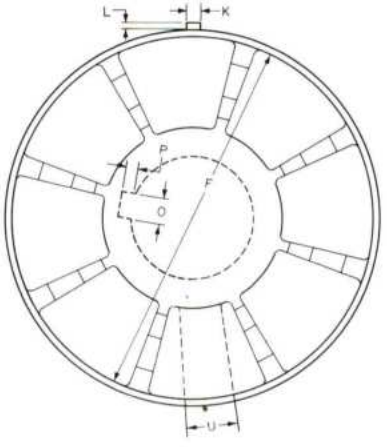
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
LUG-TYPE PAD DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 5" to 9" SIZES
- LARGE BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

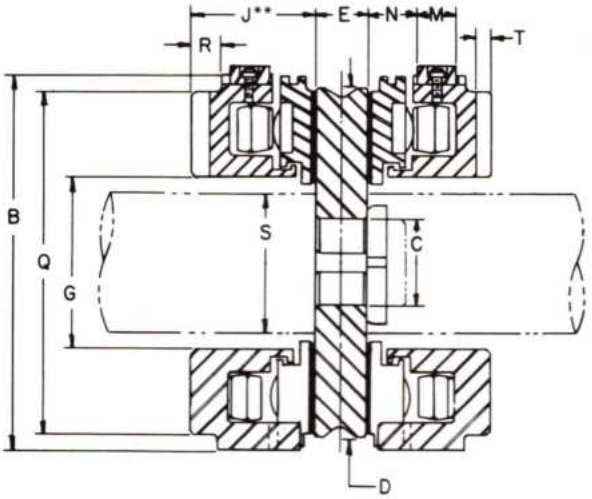
THRUST BEARING SIZES			5		6		7		8		9	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	005-880		006-880		007-880		008-880		009-880	
	DOUBLE W/COLLAR		005-881		006-881		007-881		008-881		009-881	
	SINGLE W/O COLLAR		005-800		006-800		007-800		008-800		009-800	
	SINGLE W/COLLAR		005-801		006-801		007-801		008-801		009-801	
	DOUBLE W/O COLLAR	6 PAD	005-660		006-660		007-660		008-660		009-660	
	DOUBLE W/COLLAR		005-661		006-661		007-661		008-661		009-661	
	SINGLE W/O COLLAR		005-600		006-600		007-600		008-600		009-600	
	SINGLE W/COLLAR		005-601		006-601		007-601		008-601		009-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		5	2.3	10	4.5	14	6.4	20	9.1	31	14.1
	DOUBLE W/O COLLAR		10	4.5	20	9.1	28	12.7	41	18.6	63	28.6
	COLLAR		4	1.8	7	3.2	11	5.0	16	7.3	21	9.5
	PADS (SET 8 OR 6)		2	.9	4	1.8	6	2.7	9	4.1	12	5.4
A	AREA PER SIDE (SQ)*		11.6	74.8	16.7	107.8	23.0	148.4	29.9	192.9	37.8	243.8
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5	9.365	237.9
C	COLLAR BORE		1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2	3.500	88.9
D	COLLAR O.D. TURN		5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5	9.13	231.9
E	COLLAR THICKNESS		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
F	THRUST PAD O.D.		5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2	9.0	228.6
G	RETAINER RING BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
H	PAD BORE		2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3	4.94	125.5
J1	ASSEMBLY HT - STD.**		1.75	44.4	2.0	50.8	2.25	57.2	2.56	65.1	2.75	69.9
J2	ASSEMBLY HT - ALT.**		1.75	44.4	2.06	52.4	2.38	60.3	2.69	68.3	3.0	76.2
J3	ASSEMBLY HT - ALT.**		1.62	41.2	1.88	47.8	2.12	53.9	2.38	60.5	2.69	68.3
K	CASING KEY WIDTH		.31	7.9	.38	9.7	.38	9.7	.44	11.2	.44	11.2
L	CASING KEY HEIGHT		.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8
M	CASING KEY LENGTH		.50	12.7	.63	16.0	.63	16.0	.69	17.5	.75	19.1
N	COLLAR TO KEY		.69	17.5	.75	19.1	.88	22.4	1.00	25.4	1.50	38.1
O	COLLAR KEY WIDTH		.38	9.7	.38	9.7	.50	12.7	.63	16.0	.63	16.0
P	COLLAR KEY DEPTH		.19	4.8	.19	4.8	.25	6.4	.31	7.9	.31	7.9
Q	OIL ANNULUS DIAMETER		5.06	128.5	5.88	149.4	6.88	174.8	7.75	196.9	8.75	222.3
R	OIL ANNULUS HEIGHT		.38	9.7	.56	14.2	.63	16.0	.75	19.1	.75	19.1
S	MAX. SHAFT SIZE		2.50	63.5	3.06	77.8	3.56	90.4	4.13	104.9	4.69	119.1
T	OIL INLET HEIGHT		.28	7.1	.31	7.9	.31	7.9	.38	9.7	.38	9.7
U	OIL INLET WIDTH		.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1

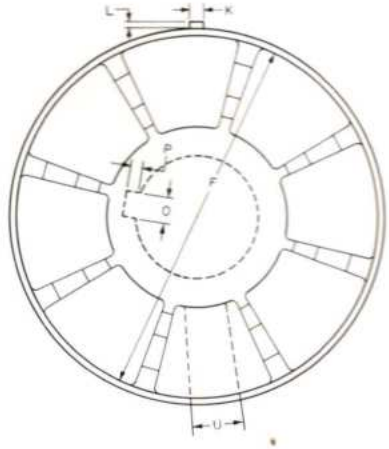
PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
LUG-TYPE DESIGN -- EIGHT-PAD OR SIX-PAD THRUST BEARINGS





- 10-1/2" to 17" SIZES
- LARGE BORE
- SELF-LEVELING
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

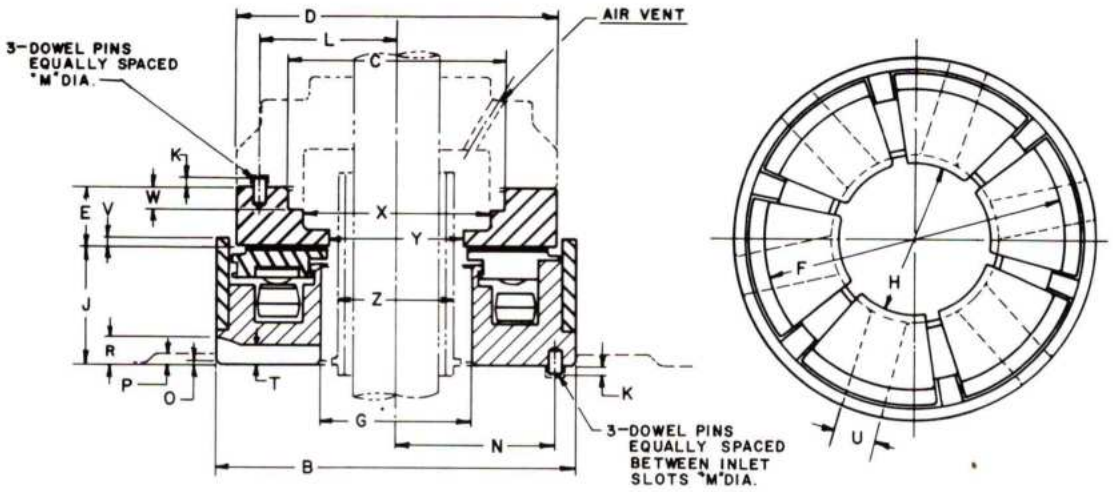
THRUST BEARING SIZES			10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	8 PAD	010-880		012-880		013-880		015-880		017-880	
	DOUBLE W/COLLAR	8 PAD	010-881		012-881		013-881		015-881		017-881	
	SINGLE W/O COLLAR	8 PAD	010-800		012-800		013-800		015-800		017-800	
	SINGLE W/COLLAR	8 PAD	010-801		012-801		013-801		015-801		017-801	
	DOUBLE W/O COLLAR	6 PAD	010-660		012-660		013-660		015-660		017-660	
	DOUBLE W/COLLAR	6 PAD	010-661		012-661		013-661		015-661		017-661	
	SINGLE W/O COLLAR	6 PAD	010-600		012-600		013-600		015-600		017-600	
	SINGLE W/COLLAR	6 PAD	010-601		012-601		013-601		015-601		017-601	
WEIGHTS			LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR		44	20.0	65	29.5	90	40.8	125	56.7	179	81.2
	DOUBLE W/O COLLAR		89	40.4	129	58.5	181	82.1	251	113.9	359	162.8
	COLLAR		36	16.3	49	22.2	70	31.8	97	44.0	146	66.2
	PADS (SET 8 OR 6)		20	9.1	26	11.8	35	15.9	47	21.3	69	31.3
A	AREA PER SIDE (SQ)*		51.5	332.3	66.8	431.0	84.8	547.1	104.7	675.0	134.4	867.0
			inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN		10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE		4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN		10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS		1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.		10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE		5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
J1	ASSEMBLY HT - STD.**		3.13	79.4	3.50	88.9	4.0	101.6	4.38	111.3	5.0	127.0
J2	ASSEMBLY HT - ALT.**		3.38	85.7	3.75	95.3	4.25	108.0	4.63	117.6	5.25	133.4
J3	ASSEMBLY HT - ALT.**		2.94	74.7	3.25	82.6	3.56	90.4	3.88	98.6	4.38	111.3
K	CASING KEY WIDTH		.50	12.7	.56	14.2	.63	16.0	.69	17.5	.75	19.1
L	CASING KEY HEIGHT		.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
M	CASING KEY LENGTH		.88	22.4	1.00	25.4	1.25	31.8	1.38	35.1	1.50	38.1
N	COLLAR TO KEY		1.19	30.2	1.31	33.3	1.50	38.1	1.56	39.6	1.75	44.5
O	COLLAR KEY WIDTH		.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
P	COLLAR KEY DEPTH		.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
Q	OIL ANNULUS DIAMETER		10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT		.94	23.9	1.0	25.4	1.25	31.8	1.38	35.1	1.50	38.1
S	MAX. SHAFT SIZE		5.38	124.0	6.25	158.8	7.06	179.3	7.75	196.9	8.88	225.6
T	OIL INLET HEIGHT		.44	11.2	.50	12.7	.63	16.0	.69	17.5	.88	22.4
U	OIL INLET WIDTH		1.63	41.4	1.75	44.5	2.00	50.8	2.25	57.2	2.50	63.5

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.

* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

** WHEN ORDERING PLEASE SPECIFY J1, J2 OR J3 DIMENSION. OTHER DIMENSIONS AVAILABLE UPON REQUEST.

WAUKESHA
SELF-LEVELING DESIGN
SIX-PAD THRUST BEARINGS

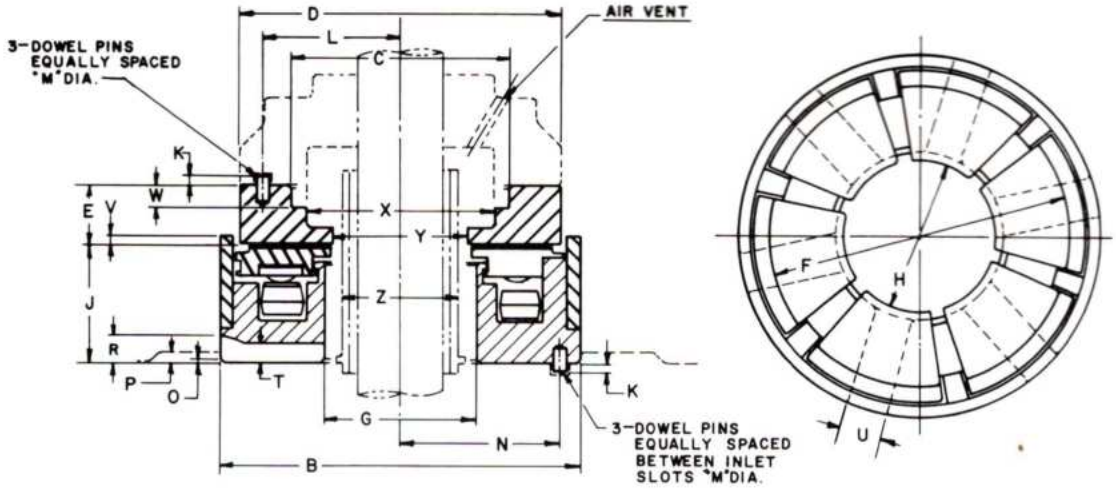


- 4" to 8" SIZES
- SELF-LEVELING
- SOLID
- VERTICAL ONLY
- SINGLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		4		5		6		7		8	
CATALOG ORDERING NUMBER	SINGLE W/O COLLAR	204-600		205-600		206-600		207-600		208-600	
	SINGLE W/COLLAR	204-601		205-601		206-601		207-601		208-601	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	6	2.7	10	4.5	16	7.3	23	10.5	32	14.6
	SINGLE W/COLLAR	8	3.7	13	5.9	21	9.5	31	14.1	44	20.1
A	AREA PER SIDE (SQ)*	8.0	51.6	12.5	81.0	18.0	116.0	24.5	158.0	32.0	206.0
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	4.985	126.6	5.985	152.0	6.985	177.4	7.985	202.8	9.110	231.4
C	RUNNER BORE	2.750	69.9	3.375	85.7	4.000	101.6	4.625	117.5	5.250	133.4
D	RUNNER O.D. TURN	4.125	104.8	5.13	130.3	6.13	155.7	7.13	181.1	8.13	206.5
E	RUNNER THICKNESS	.75	19.1	.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1
F	THRUST PAD O.D.	4.0	101.6	5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2
G	RETAINER BORE	2.19	55.6	2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3
H	THRUST PAD BORE	2.0	50.8	2.50	63.5	3.0	76.2	3.50	88.9	4.0	101.6
J	ASSEMBLY THICKNESS	1.44	36.6	1.75	44.5	2.06	52.3	2.38	60.5	2.69	68.3
K	DOWEL PIN HEIGHT	.125	3.2	.19	4.8	.19	4.8	.19	4.8	.25	6.4
L	DOWEL PIN RADIUS	1.75	44.5	2.19	55.6	2.625	66.7	3.13	79.5	3.56	90.4
M	DOWEL PIN DIAMETER	.19	4.8	.31	7.9	.38	9.7	.38	9.7	.44	11.2
N	DOWEL PIN RADIUS	2.125	54.0	2.69	68.3	3.13	79.5	3.625	92.1	4.06	103.1
O	RETAINER CHAMFER	.06	1.5	.06	1.5	.06	1.5	.09	2.3	.09	2.3
P	CASING WALL HEIGHT	.25	6.4	.25	6.4	.25	6.4	.25	6.4	.25	6.4
R	OIL INLET HEIGHT	.31	7.9	.38	9.7	.44	11.2	.50	12.7	.625	15.9
T	OIL PASSAGE HEIGHT	.19	4.8	.31	7.9	.38	9.7	.44	11.2	.50	12.7
U	OIL PASSAGE WIDTH	.625	15.9	.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1
V	RETAINER PROJECTION	.19	4.8	.19	4.8	.25	6.4	.25	6.4	.25	6.4
W	RUNNER GUIDE DEPTH	.22	5.6	.28	7.1	.31	7.9	.31	7.9	.34	8.6
X	CLEARANCE BORE	2.38	60.5	2.69	68.3	3.19	81.0	3.75	95.3	4.25	108.0
Y	RUNNER BORE	1.88	47.8	2.38	60.5	2.88	73.2	3.38	85.9	3.88	98.6
Z	STAND PIPE O.D.	1.625	41.3	2.19	55.6	2.63	66.8	3.19	81.0	3.69	93.7

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SELF-LEVELING DESIGN
SIX-PAD THRUST BEARINGS

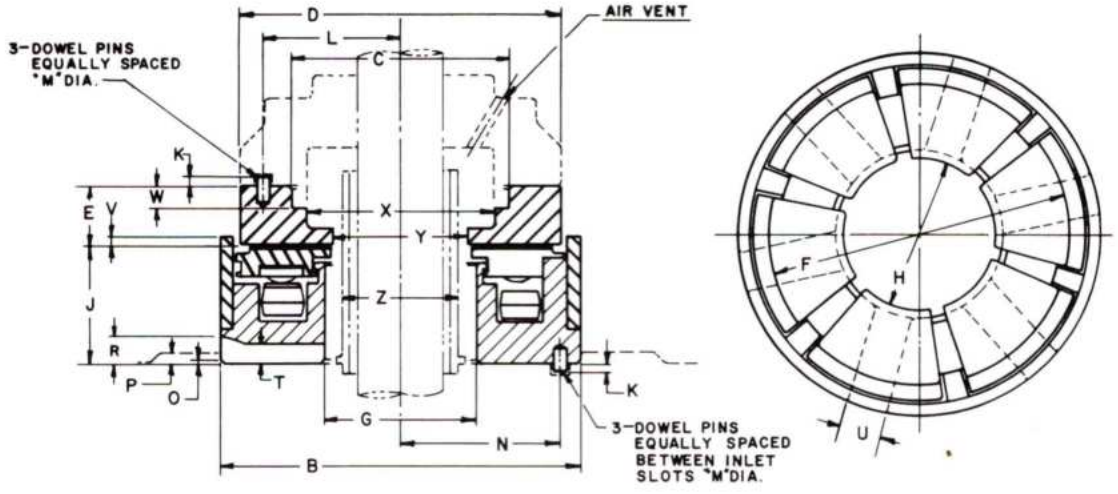


- 9" to 17" SIZES
- SELF-LEVELING
- SOLID
- VERTICAL ONLY
- SINGLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		9		10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	SINGLE W/O/COLLAR	209-600		210-600		212-600		213-600		215-600		217-600	
	SINGLE W/COLLAR	209-601		210-601		212-601		213-601		215-601		217-601	
		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
WEIGHTS	SINGLE W/O COLLAR	44	20.1	67	30.6	91	41.5	124	56.5	171	78.0	263	119.9
	SINGLE W/COLLAR	60	27.4	93	42.4	134	61.1	185	84.4	252	114.9	380	173.3
A	AREA PER SIDE (SQ)*	40.5	261.0	55.1	356.0	72.0	465.0	91.1	588.0	112.5	725.9	144.5	932.3
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	10.110	256.8	11.735	298.1	13.360	339.3	14.860	377.4	16.485	418.7	18.610	472.7
C	RUNNER BORE	6.000	152.4	7.000	177.8	8.000	203.2	9.000	228.6	10.000	254.0	11.250	285.8
D	RUNNER O.D. TURN	9.13	231.9	10.69	271.5	12.18	309.4	13.69	347.7	15.19	385.8	17.25	438.2
E	RUNNER THICKNESS	1.50	38.1	1.75	44.5	2.0	50.8	2.25	57.2	2.50	63.5	2.75	69.9
F	THRUST PAD O.D.	9.00	228.6	10.50	266.7	12.0	304.8	13.50	342.9	15.0	381.0	17.0	431.8
G	RETAINER BORE	4.94	125.5	5.75	146.1	6.625	168.3	7.44	189.0	8.25	209.6	9.38	238.3
H	THRUST PAD BORE	4.50	114.3	5.25	133.4	6.0	152.4	6.75	171.5	7.50	190.5	8.50	215.9
J	ASSEMBLY THICKNESS	3.00	76.2	3.38	85.9	3.75	95.3	4.25	108.0	4.625	117.5	5.25	133.4
K	DOWEL PIN HEIGHT	.25	6.4	.28	7.1	.31	7.9	.38	9.7	.44	11.2	.44	11.2
L	DOWEL PIN RADIUS	4.06	103.1	4.75	120.7	5.44	138.2	6.13	155.7	6.81	173.0	7.75	196.9
M	DOWEL PIN DIAMETER	.44	11.2	.50	12.7	.56	14.2	.625	15.9	.69	17.5	.75	19.1
N	DOWEL PIN RADIUS	4.56	115.8	5.31	134.9	6.0	152.4	6.75	171.5	7.56	192.0	8.50	215.9
O	RETAINER CHAMFER	.09	2.3	.13	3.3	.13	3.3	.13	3.3	.13	3.3	.19	4.8
P	CASING WALL HEIGHT	.25	6.4	.38	9.7	.38	9.7	.38	9.7	.38	9.7	.50	12.7
R	OIL INLET HEIGHT	.75	19.1	.88	22.4	1.0	25.4	1.13	28.7	1.25	31.8	1.25	31.8
T	OIL PASSAGE HEIGHT	.625	15.9	.69	17.5	.75	19.1	.88	22.4	.94	23.9	1.13	28.7
U	OIL PASSAGE WIDTH	1.50	38.1	1.625	41.3	1.75	44.5	2.0	50.8	2.25	57.2	2.50	63.5
V	RETAINER PROJECTION	.31	7.9	.31	7.9	.31	7.9	.38	9.7	.38	9.7	.38	9.7
W	RUNNER GUIDE DEPTH	.34	8.6	.44	11.2	.41	10.4	.50	12.7	.53	13.5	.56	14.2
X	CLEARANCE BORE	4.88	124.0	5.56	141.2	6.44	163.6	7.25	184.2	8.0	203.2	9.0	228.6
Y	RUNNER BORE	4.38	111.3	5.06	128.5	5.81	147.6	6.56	166.6	7.31	185.7	8.25	209.6
Z	STAND PIPE O.D.	4.19	106.4	4.81	122.2	5.56	141.2	6.31	160.3	7.06	179.3	7.94	201.7

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SELF-LEVELING DESIGN
SIX-PAD THRUST BEARINGS

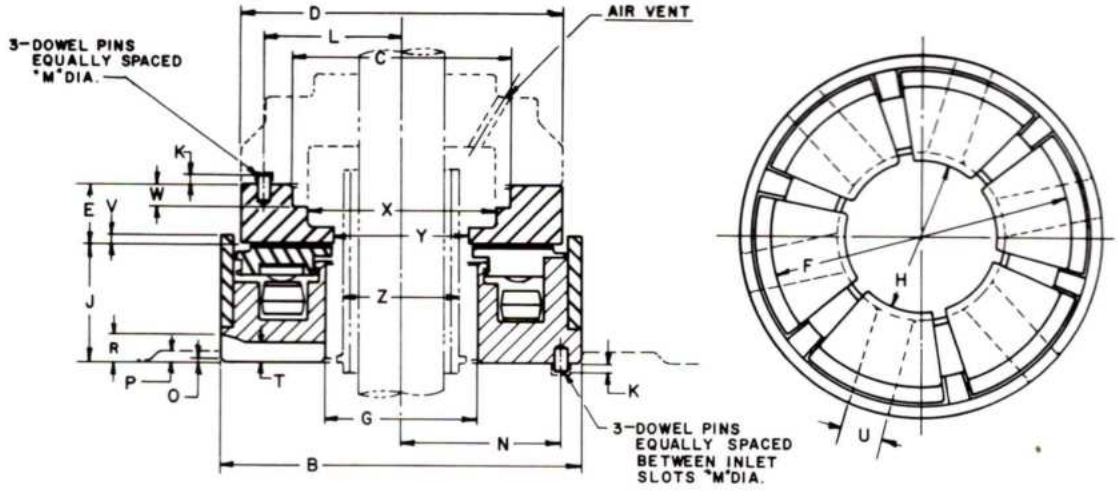


- 19" to 27" SIZES
- SELF-LEVELING
- SOLID
- VERTICAL ONLY
- SINGLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		19		21		23		25		27	
CATALOG ORDERING NUMBER	SINGLE W/O COLLAR	219-600		221-600		223-600		225-600		227-600	
	SINGLE W/COLLAR	219-601		221-601		223-601		225-601		227-601	
		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
WEIGHTS	SINGLE W/O COLLAR	240	109.4	317	144.6	412	187.9	514	234.4	656	299.1
	SINGLE W/COLLAR	399	181.9	512	233.5	635	289.6	826	376.7	1020	465.1
A	AREA PER SIDE (SQ)*	180.0	1161.0	220.0	1419.0	264.0	1702.8	312.0	2012.4	364.0	2347.8
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	20.235	514.0	22.235	564.8	24.480	621.8	26.480	672.6	28.730	729.7
C	RUNNER BORE	12.625	320.7	13.750	349.3	14.625	371.5	16.000	406.4	17.125	435.0
D	RUNNER O.D. TURN	19.25	489.0	21.25	539.8	23.25	590.6	25.25	641.4	27.25	692.2
E	RUNNER THICKNESS	3.0	76.2	3.0	76.2	3.0	76.2	3.37	85.6	3.37	85.6
F	THRUST PAD O.D.	19.0	482.6	21.0	533.4	23.0	584.2	25.0	635.0	27.0	685.8
G	RETAINER BORE	10.625	269.9	11.75	298.5	12.75	323.9	14.0	355.6	15.0	381.0
H	THRUST PAD BORE	9.50	241.3	10.50	266.7	11.50	292.1	12.50	317.5	13.50	342.9
J	ASSEMBLY THICKNESS	4.75	120.7	5.25	133.4	5.68	144.3	6.18	157.0	6.68	169.7
K	DOWEL PIN HEIGHT	.50	12.7	.56	14.2	.56	14.2	.56	14.2	.68	17.3
L	DOWEL PIN RADIUS	8.625	219.1	9.50	241.3	10.50	266.7	11.50	292.1	12.25	311.2
M	DOWEL PIN DIAMETER	.87	22.1	1.0	25.4	1.0	25.4	1.0	25.4	1.25	31.8
N	DOWEL PIN RADIUS	9.25	235.0	10.18	258.6	11.31	287.3	12.31	312.7	13.31	388.1
O	RETAINER CHAMFER	.06	1.5	.06	1.5	.06	1.5	.06	1.5	.06	1.5
P	CASING WALL HEIGHT	.25	6.4	.25	6.4	.25	6.4	.25	6.4	.25	6.4
R	OIL INLET HEIGHT	.87	22.1	1.0	25.4	1.0	25.4	1.12	28.5	1.18	30.0
T	OIL PASSAGE HEIGHT	.56	14.2	.68	17.3	.75	19.1	.81	20.6	.87	22.1
U	OIL PASSAGE WIDTH	3.75	95.3	3.87	98.3	4.0	101.6	4.25	108.0	4.62	117.4
V	RETAINER PROJECTION	.37	9.4	.37	9.4	.37	9.4	.37	9.4	.50	12.7
W	RUNNER GUIDE DEPTH	.68	17.3	.81	20.6	.81	20.6	.81	20.6	.93	23.6
X	CLEARANCE BORE	10.12	257.1	11.12	282.5	12.12	307.9	13.25	336.6	14.25	362.0
Y	RUNNER BORE	9.25	235.0	10.25	260.4	11.25	285.8	12.25	311.2	13.25	336.6
Z	STAND PIPE O.D.	8.87	225.3	9.87	250.7	10.81	274.6	11.75	298.5	12.62	320.6

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SELF-LEVELING DESIGN
SIX-PAD THRUST BEARINGS

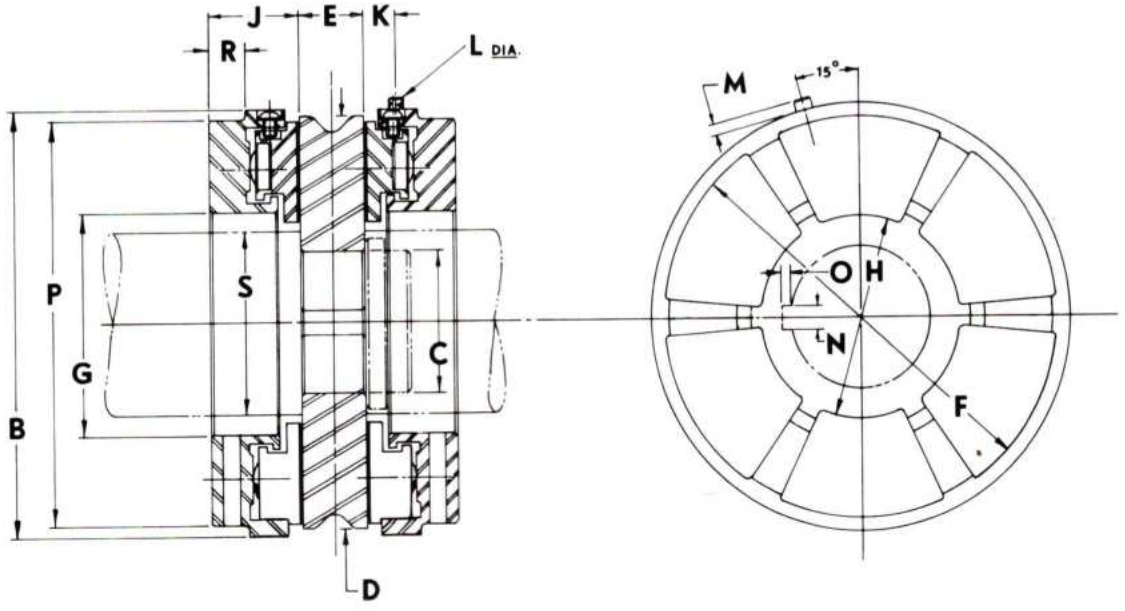


- 29" to 45" SIZES
- SELF-LEVELING
- SOLID
- VERTICAL ONLY
- SINGLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		29		31		33		37		41		45	
CATALOG ORDERING NUMBER	SINGLE W/O COLLAR	229-600		231-600		233-600		237-600		241-600		245-600	
	SINGLE W/COLLAR	229-601		231-601		233-601		237-601		241-601		245-601	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	792	361.2	978	446.0	1275	581.4	1683	767.5	2233	1018.3	3035	1384.0
	SINGLE W/COLLAR	1218	555.4	1475	672.6	1875	855.0	2478	1130.0	3260	1486.6	4310	1965.4
A	AREA PER SIDE (SQ)*	420.0	2709.0	480.0	3096.0	545.0	3515.3	684.0	4411.8	840.0	5418.0	1012.0	6527.4
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	30.730	780.5	32.980	837.7	34.980	888.5	38.480	977.4	43.730	1110.7	47.980	1218.7
C	RUNNER BORE	18.000	457.2	18.875	479.4	20.500	520.7	22.375	568.3	24.500	622.3	26.750	679.5
D	RUNNER O.D. TURN	29.38	746.3	31.38	797.1	33.38	847.9	37.50	952.5	41.50	1054.1	45.50	1155.7
E	RUNNER THICKNESS	3.38	85.9	3.38	85.9	3.75	95.3	3.75	95.3	4.0	101.6	4.13	104.9
F	THRUST PAD O.D.	29.0	736.6	31.0	787.4	33.0	838.2	37.0	939.8	41.0	1041.4	45.0	1143.0
G	RETAINER BORE	16.25	412.8	17.25	438.2	18.5	469.9	20.75	527.1	23.0	584.2	25.0	635.0
H	THRUST PAD BORE	14.50	368.3	15.50	393.7	16.5	419.1	18.50	469.9	20.5	520.7	22.50	571.5
J	ASSEMBLY THICKNESS	7.13	181.1	7.63	193.8	8.13	206.5	9.0	228.6	10.0	254.0	11.0	279.4
K	DOWEL PIN HEIGHT	.69	17.5	.69	17.5	.69	17.5	.81	20.6	.81	20.6	.81	20.6
L	DOWEL PIN RADIUS	13.25	336.6	14.25	362.0	15.25	387.4	17.0	431.8	19.0	482.6	21.0	533.4
M	DOWEL PIN DIAMETER	1.25	31.8	1.25	31.8	1.25	31.8	1.50	38.1	1.50	38.1	1.50	38.1
N	DOWEL PIN RADIUS	14.13	358.9	15.13	384.3	16.13	409.7	18.25	463.6	20.13	511.3	22.06	560.3
O	RETAINER CHAMFER	.06	1.5	.06	1.5	.13	3.3	.13	3.3	.13	3.3	.13	3.3
P	CASING WALL HEIGHT	.25	6.4	.25	6.4	.38	9.7	.38	9.7	.38	9.7	.38	9.7
R	OIL INLET HEIGHT	1.25	31.8	1.38	35.1	1.44	36.6	1.56	39.6	1.75	44.5	1.94	49.3
T	OIL PASSAGE HEIGHT	.88	22.4	.88	22.4	.88	22.4	1.06	26.9	1.25	31.8	1.38	35.1
U	OIL PASSAGE WIDTH	5.0	127.0	5.50	139.7	6.25	158.8	6.38	162.1	6.50	165.1	6.75	171.5
V	RETAINER PROJECTION	.50	12.7	.50	12.7	.50	12.7	.50	12.7	.50	12.7	.50	12.7
W	RUNNER GUIDE DEPTH	.94	23.9	.94	23.9	.94	23.9	1.13	28.7	1.13	28.7	1.13	28.7
X	CLEARANCE BORE	15.13	384.3	16.13	409.7	17.25	438.2	19.13	485.9	21.13	536.7	23.13	587.5
Y	RUNNER BORE	14.13	358.9	15.13	384.3	16.13	409.7	18.0	457.2	20.0	508.0	22.0	558.8
Z	STAND PIPE O.D.	13.63	346.2	14.50	368.3	15.50	393.7	17.13	435.1	19.25	489.0	21.13	536.7

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
NON-EQUALIZING DESIGN
SIX-PAD THRUST BEARINGS

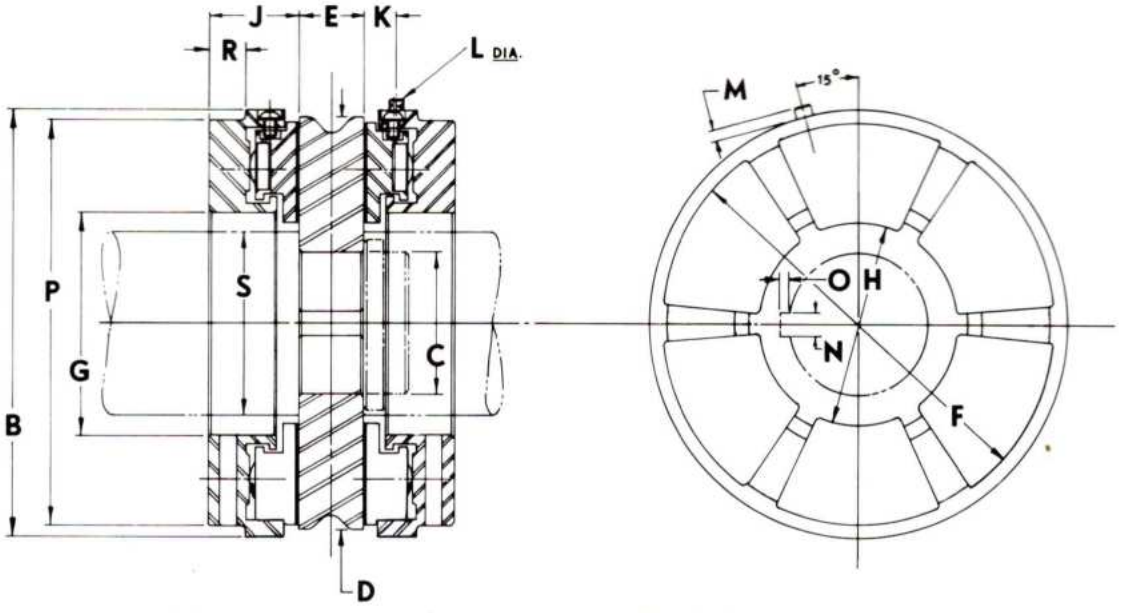


- 4" to 8" SIZES
- STANDARD BORE
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

THRUST BEARING SIZES		4		5		6		7		8	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	104-660		105-660		106-660		107-660		108-660	
	DOUBLE W/COLLAR	104-661		105-661		106-661		107-661		108-661	
	SINGLE W/O COLLAR	104-600		105-600		106-600		107-600		108-600	
	SINGLE W/COLLAR	104-601		105-601		106-601		107-601		108-601	
		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
WEIGHTS	SINGLE W/O COLLAR	3	1.4	5	2.3	8	3.7	12	5.4	17	7.8
	DOUBLE W/O COLLAR	6	2.7	10	4.5	16	7.3	24	10.9	34	15.5
	COLLAR	3	1.4	4	1.8	7	3.2	11	5.0	16	7.3
A	AREA PER SIDE (SQ)*	8.0		12.5	81.0	18.0	116.0	24.5	158.0	32.0	206.0
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	4.365	110.9	5.365	136.3	6.365	161.7	7.365	187.1	8.365	212.5
C	COLLAR BORE	1.250	31.8	1.750	44.5	2.125	54.0	2.500	63.5	3.000	76.2
D	COLLAR O.D. TURN	4.13	104.9	5.13	130.3	6.13	155.7	7.13	181.0	8.13	206.5
E	COLLAR THICKNESS	.75	19.1	.88	22.4	1.0	25.4	1.25	31.8	1.38	35.1
F	THRUST PAD O.D.	4.0	101.6	5.0	127.0	6.0	152.4	7.0	177.8	8.0	203.2
G	RETAINER RING BORE	2.19	55.6	2.75	69.9	3.31	84.1	3.81	96.8	4.38	111.3
H	PAD BORE	2.0	50.8	2.50	63.5	3.0	76.2	3.50	88.9	4.0	101.6
J	ASSEMBLY THICKNESS	.94	23.9	1.125	28.6	1.38	35.1	1.50	38.1	1.69	42.9
K	COLLAR TO DOWEL LENGTH	.38	9.7	.50	12.7	.53	13.5	.60	15.2	.72	18.3
L	DOWEL DIAMETER	.25	6.4	.31	7.9	.375	9.5	.38	9.7	.44	11.2
M	DOWEL HEIGHT	.125	3.2	.16	4.1	.19	4.8	.19	4.8	.19	4.8
N	COLLAR KEY WIDTH	.31	7.9	.38	9.7	.38	9.7	.50	12.7	.625	15.9
O	COLLAR KEY DEPTH	.16	4.1	.19	4.8	.19	4.8	.25	6.4	.31	7.9
P	OIL ANNULUS DIAMETER	4.13	104.9	5.06	128.5	6.0	152.4	6.88	174.8	7.75	196.9
R	OIL ANNULUS HEIGHT	.38	9.7	.38	9.7	.56	14.2	.625	15.9	.625	15.9
S	MAX. SHAFT SIZE	1.75	44.5	2.25	57.2	2.75	69.9	3.25	82.6	3.75	95.3

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
NON-EQUALIZING DESIGN
SIX-PAD THRUST BEARINGS

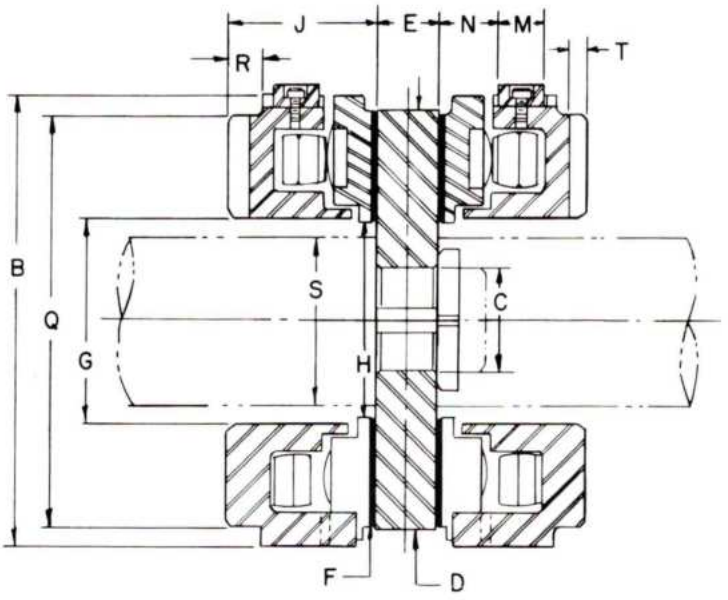


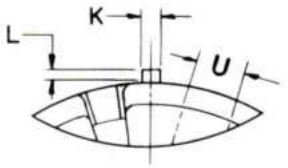
- 9" to 17" SIZES
- STANDARD BORE
- SOLID OR SPLIT
- HORIZONTAL OR VERTICAL
- SINGLE OR DOUBLE
- CONVENTIONAL OR DIRECTED OIL FLOW
- WITH OR WITHOUT THRUST COLLAR

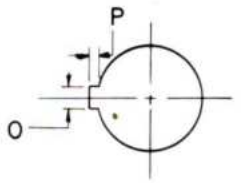
THRUST BEARING SIZES		9		10-1/2		12		13-1/2		15		17	
CATALOG ORDERING NUMBER	DOUBLE W/O COLLAR	109-660		110-660		112-660		113-660		115-660		117-660	
	DOUBLE W/COLLAR	109-661		110-661		112-661		113-661		115-661		117-661	
	SINGLE W/O COLLAR	109-600		110-600		112-600		113-600		115-600		117-600	
	SINGLE W/COLLAR	109-601		110-601		112-601		113-601		115-601		117-601	
WEIGHTS		LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
	SINGLE W/O COLLAR	23	10.5	35	15.9	50	22.8	70	31.8	94	42.9	133	60.7
	DOUBLE W/O COLLAR	46	30.0	70	31.8	100	45.6	140	63.8	188	85.7	266	121.3
	COLLAR	21	9.5	36	16.3	49	22.2	70	31.8	98	44.0	146	66.2
A	AREA PER SIDE (SQ)*	40.5	261.0	55.1	356.0	72.0	465.0	91.1	588.0	112.5	725.9	144.5	932.5
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	9.365	237.9	10.985	279.0	12.485	317.1	13.985	355.2	15.485	393.3	17.610	447.3
C	COLLAR BORE	3.500	88.9	4.125	104.8	4.750	120.7	5.375	136.5	6.000	152.4	6.625	168.3
D	COLLAR O.D. TURN	9.13	231.9	10.69	271.5	12.19	309.6	13.69	347.7	15.19	385.8	17.25	438.2
E	COLLAR THICKNESS	1.50	38.1	1.75	44.5	2.0	50.8	2.25	57.2	2.5	63.5	2.88	73.2
F	THRUST PAD O.D.	9.0	228.6	10.50	266.7	12.0	304.8	13.5	342.9	15.0	381.0	17.0	431.8
G	RETAINER RING BORE	4.94	125.5	5.75	146.1	6.63	168.4	7.44	189.0	8.25	209.6	9.38	238.3
H	PAD BORE	4.50	114.3	5.25	133.4	6.0	152.4	6.75	171.5	7.50	190.5	8.50	215.9
J	ASSEMBLY THICKNESS	1.81	46.0	2.0	50.8	2.25	57.2	2.50	63.5	2.75	69.9	3.0	76.2
K	COLLAR TO DOWEL LENGTH	.81	20.6	.88	22.4	.94	23.9	1.0	25.4	1.125	28.6	1.19	30.2
L	DOWEL DIAMETER	.438	11.1	.50	12.7	.56	14.2	.625	15.9	.69	17.5	.75	19.1
M	DOWEL PIN DIAMETER	.19	4.8	.22	5.6	.22	5.6	.25	6.4	.31	7.9	.31	7.9
N	COLLAR KEY WIDTH	.625	15.9	.75	19.1	.75	19.1	.88	22.4	1.0	25.4	1.0	25.4
O	COLLAR KEY DEPTH	.31	7.9	.38	9.7	.38	9.7	.44	11.2	.50	12.7	.50	12.7
P	OIL ANNULUS DIAMETER	8.75	222.3	10.25	260.4	11.56	293.6	13.0	330.2	14.50	368.3	16.50	419.1
R	OIL ANNULUS HEIGHT	.625	15.9	.75	19.1	.88	22.4	1.0	25.4	1.125	28.6	1.25	31.8
S	MAX. SHAFT SIZE	4.25	108.0	4.88	124.0	5.63	143.0	6.38	162.1	7.0	177.8	8.0	203.2

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SPECIAL TILTING PAD DESIGN
SELF-LEVELING THRUST BEARINGS



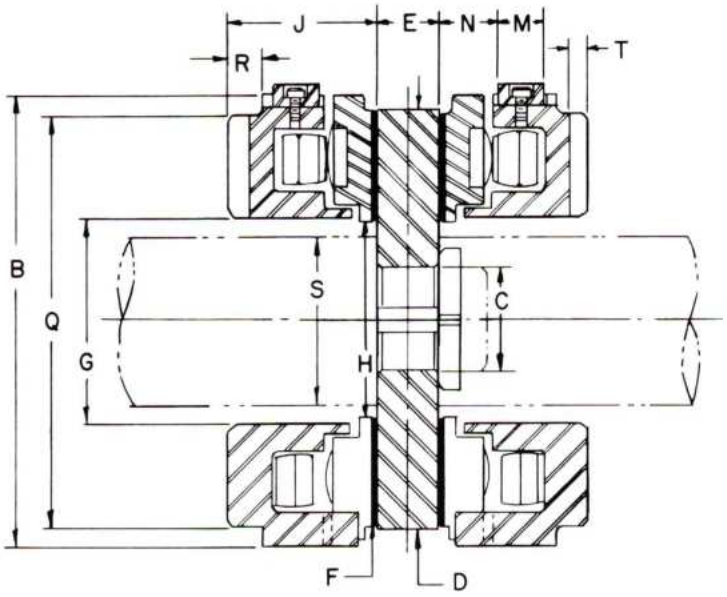


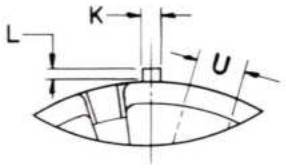


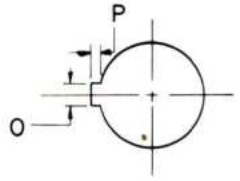
	THRUST BEARING SIZES	3-1/2		4-3/8		4-1/2		5-1/2		8		9-3/4	
	NUMBER OF PADS	6		4		6		6		12		12	
A	AREA PER SIDE (SQ)*	6.1	39.4	6.5	41.9	10.1	65.2	15.0	96.8	18.0	116.1	29.0	187.1
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	3.865	98.2	4.807	122.1	4.865	123.6	5.865	149.0	8.687	220.7	9.985	253.6
C	COLLAR BORE	1.0	25.4	1.25	31.8	1.812	46.0	2.38	60.5	4.38	110.3	6.0	152.4
D	COLLAR O.D. TURN	3.63	92.2	4.50	114.3	4.63	117.6	5.63	143.0	8.13	206.5	9.94	252.5
E	COLLAR THICKNESS	.75	19.1	.63	16.0	.88	22.4	1.0	25.4	.88	22.4	1.25	31.8
F	THRUST PAD O.D.	3.50	88.9	4.38	111.3	4.50	114.3	5.63	143.0	8.0	203.2	9.75	247.7
G	RETAINER RING BORE	1.94	49.3	1.88	47.8	2.50	63.5	3.06	77.7	6.0	152.4	7.0	177.8
H	PAD BORE	1.75	44.5	2.13	54.1	2.25	57.2	2.75	69.9	6.0	152.4	7.0	177.8
J	ASSEMBLY THICKNESS	1.25	31.8	1.66	42.2	1.63	41.4	1.88	47.8	1.75	44.5	1.69	42.9
K	CASING KEY WIDTH	.31	7.9	.38	9.7	.38	9.7	.38	9.7	.38	9.7	.38	9.7
L	CASING KEY HEIGHT	.16	4.1	.19	4.8	.19	4.8	.19	4.8	.19	4.8	.19	4.8
M	CASING KEY LENGTH	.38	9.7	.63	16.0	.50	12.7	.50	12.7	.63	16.0	.50	12.7
N	COLLAR TO KEY LENGTH	.50	12.7	.94	23.9	.31	7.9	.69	17.5	.69	17.5	.69	17.5
O	COLLAR KEY WIDTH	.25	6.4	.25	6.4	.51	13.0	.38	9.7	.63	16.0	.75	19.1
P	COLLAR KEY DEPTH	.13	3.3	.13	3.3	.16	4.1	.19	4.8	.31	7.9	.38	9.7
Q	OIL ANNULUS DIAMETER	3.56	90.4	4.19	106.4	4.44	112.8	5.31	134.9	8.38	212.9	9.56	242.8
R	OIL ANNULUS HEIGHT	.38	9.7	.09	2.3	.38	9.7	.44	11.2	.44	11.2	.44	11.2
S	MAXIMUM SHAFT SIZE	1.50	38.1	1.75	44.5	2.06	52.3	—	—	5.25	133.4	6.50	165.1
T	OIL INLET HEIGHT	.19	4.8	—	—	.19	4.8	.28	7.1	.25	6.4	.19	4.8
U	OIL INLET WIDTH	.50	12.7	—	—	.63	16.0	.94	23.9	.56	14.2	.63	16.0

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SPECIAL TILTING PAD DESIGN
SELF-LEVELING THRUST BEARINGS



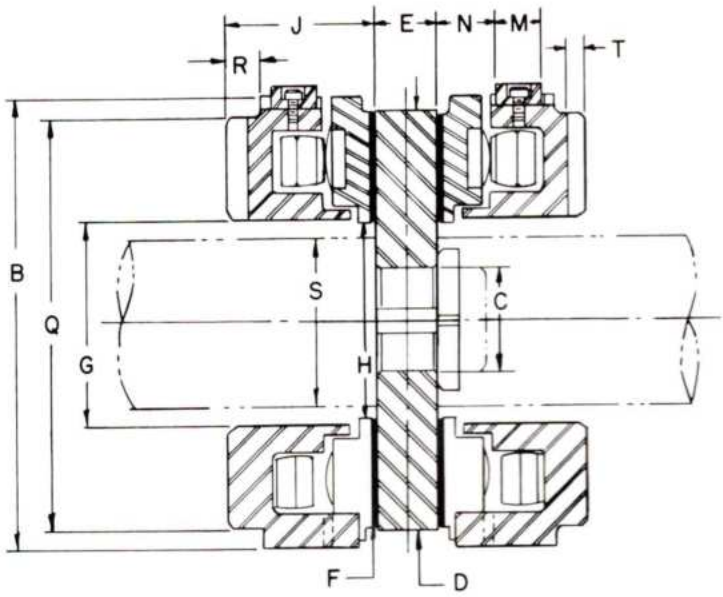


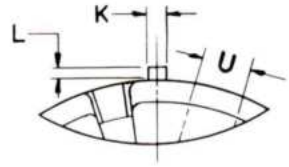


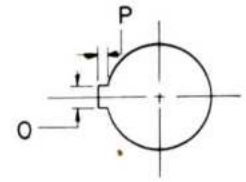
THRUST BEARING SIZES		13-1/4		14		18		20		25		30	
NUMBER OF PADS		10		10		8		8		8		16	
A	AREA PER SIDE (SQ)*	51.0	329.0	76.0	490.2	91.0	587.0	121.0	780.5	258.0	1664.1	192.0	1238.4
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	13.480	342.4	14.187	360.4	18.748	476.2	20.735	526.7	26.480	672.6	29.980	761.5
C	COLLAR BORE	7.50	190.5	7.50	190.5	Integral	—	Integral	—	Integral	—	Integral	—
D	COLLAR O.D. TURN	13.63	346.2	14.25	362.0	18.25	463.6	20.25	514.4	25.25	641.4	30.13	765.3
E	COLLAR THICKNESS	1.75	44.5	1.88	47.8	2.0	50.8	2.25	57.2	4.25	108.0	2.50	63.5
F	THRUST PAD O.D.	13.25	336.6	14.0	355.6	18.0	457.2	20.0	508.0	25.0	635.0	30.0	762.0
G	RETAINER RING BORE	9.0	228.6	8.88	225.6	12.63	320.8	14.0	355.6	15.50	393.7	24.75	628.7
H	PAD BORE	9.25	235.0	8.88	225.6	12.25	311.2	13.25	336.6	15.0	381.0	24.0	609.6
J	ASSEMBLY THICKNESS	2.69	68.3	2.69	68.3	3.50	88.9	3.88	98.6	6.17	156.7	3.50	88.9
K	CASING KEY WIDTH	.44	11.2	.44	11.2	.56	14.2	.56	14.2	1.25	31.8	.75	19.1
L	CASING KEY HEIGHT	.19	4.8	.19	4.8	.22	5.6	.22	5.6	.50	12.7	.75	19.1
M	CASING KEY LENGTH	.75	19.1	.75	19.1	1.19	30.2	1.19	30.2	2.50	63.5	1.0	25.4
N	COLLAR TO KEY LENGTH	1.13	28.7	1.13	28.7	.75	19.1	.88	22.4	2.50	63.5	1.25	31.8
O	COLLAR KEY WIDTH	.75	19.1	.75	19.1	—	—	—	—	1.50	38.1	—	—
P	COLLAR KEY DEPTH	.38	9.7	.38	9.7	—	—	—	—	.75	19.1	—	—
Q	OIL ANNULUS DIAMETER	13.13	333.5	13.50	342.9	18.38	466.9	19.75	501.7	24.75	628.7	29.38	746.3
R	OIL ANNULUS HEIGHT	.63	16.0	.69	17.5	.94	23.9	1.06	26.9	1.06	26.9	.63	16.0
S	MAXIMUM SHAFT SIZE	8.88	225.6	8.0	203.2	11.25	285.8	12.50	317.5	14.0	355.6	22.0	558.8
T	OIL INLET HEIGHT	.31	7.9	.38	9.7	.25	6.4	.63	16.0	.75	19.1	.50	12.7
U	OIL INLET WIDTH	1.0	25.4	1.25	31.8	1.75	44.5	2.0	50.8	3.0	76.2	2.0	50.8

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SPECIAL TILTING PAD DESIGN
SELF-LEVELING THRUST BEARINGS



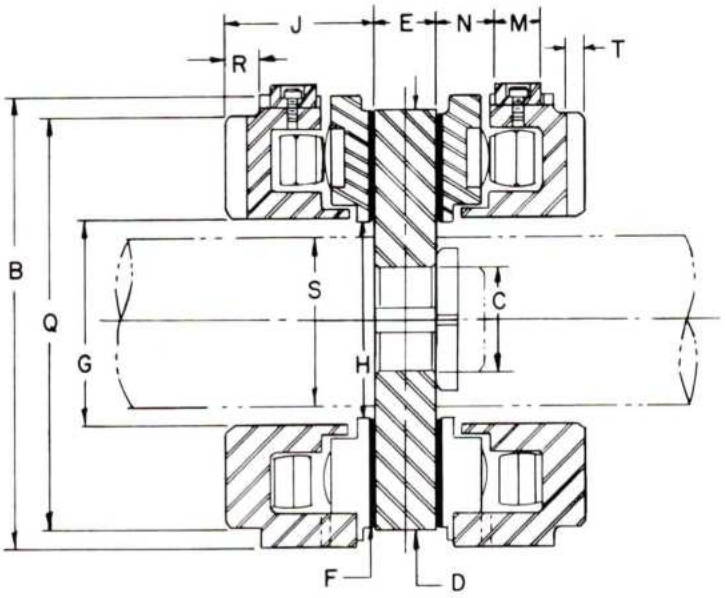


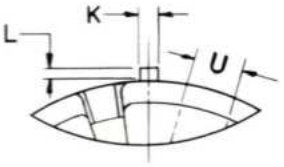


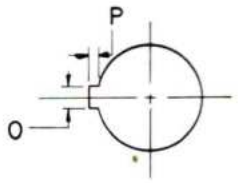
	THRUST BEARING SIZES	30-1/2		32-1/4		34-1/2		35		37		39	
	NUMBER OF PADS	8		15		6		8		6		8	
A	AREA PER SIDE (SQ)*	400.0	2580.0	229.3	1479.0	650.0	4192.5	600.0	3870.0	684.0	4411.8	792.0	5108.4
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	30.730	780.5	33.735	856.9	36.490	926.9	35.730	907.5	38.480	977.4	41.226	1047.1
C	COLLAR BORE	Integral	—	19.75	501.7	11.75	298.5	Integral	—	15.0	381.0	Integral	—
D	COLLAR O.D. TURN	30.75	781.1	32.50	825.5	34.88	886.0	35.25	895.4	37.50	952.5	41.25	1047.8
E	COLLAR THICKNESS	1.75	44.5	—	—	5.75	146.1	2.0	50.8	6.38	162.1	7.0	177.8
F	THRUST PAD O.D.	3.08	78.2	32.25	819.2	34.50	876.3	35.0	889.0	37.0	939.8	39.0	990.6
G	RETAINER RING BORE	18.50	469.9	25.88	657.4	18.25	463.6	18.50	469.9	20.75	527.1	20.50	520.7
H	PAD BORE	18.50	469.9	25.50	647.7	14.75	374.7	18.50	469.9	18.50	469.9	18.0	457.2
J	ASSEMBLY	5.0	127.0	4.63	117.6	8.63	219.2	6.75	171.5	9.0	228.6	7.25	184.2
K	CASING KEY WIDTH	1.0	25.4	1.0	25.4	1.50	38.1	1.25	31.8	1.50	38.1	1.75	44.5
L	CASING KEY HEIGHT	.44	11.2	.50	12.7	.75	19.1	.50	12.7	.56	14.2	.63	16.0
M	CASING KEY LENGTH	1.63	41.4	2.0	50.8	3.50	88.9	2.25	57.2	3.0	76.2	3.25	82.6
N	COLLAR TO KEY LENGTH	1.13	28.7	1.38	35.1	2.63	66.8	1.63	41.4	3.63	92.2	1.88	47.8
O	COLLAR KEY WIDTH	—	—	2.50	63.5	2.0	50.8	—	—	2.25	57.2	—	—
P	COLLAR KEY DEPTH	—	—	1.25	31.8	1.0	25.4	—	—	1.13	28.7	—	—
Q	OIL ANNULUS DIAMETER	29.75	755.7	32.50	825.5	—	—	34.25	870.0	36.50	927.1	37.0	939.8
R	OIL ANNULUS HEIGHT	1.38	35.1	1.0	25.4	2.88	73.2	1.63	41.4	1.56	39.6	1.63	41.4
S	MAXIMUM SHAFT SIZE	17.75	450.9	22.0	558.8	13.75	349.3	17.75	450.9	17.50	444.5	15.75	400.1
T	OIL INLET HEIGHT	.38	9.7	.75	19.1	1.19	30.2	.38	9.7	1.06	26.9	.25	6.4
U	OIL INLET WIDTH	4.0	101.6	1.50	38.1	6.25	158.8	5.0	127.0	6.38	162.1	4.0	101.6

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

WAUKESHA
SPECIAL TILTING PAD DESIGN
SELF-LEVELING THRUST BEARINGS







THRUST BEARING SIZES		41		43		45		46		50		54	
NUMBER OF PADS		8		8		8		8		8		8	
A	AREA PER SIDE (SQ)*	900.0	5805.0	810.0	5224.5	875.0	5643.8	936.0	6037.2	1175.0	7578.8	1335.0	8610.8
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
B	BEARING O.D. TURN	41.226	1047.1	44.480	1129.8	46.480	1180.6	46.480	1180.6	50.480	1282.2	54.730	1390.1
C	COLLAR BORE	Integral	—	Integral	—	Integral	—	Inegral	—	Integral	—	Integral	—
D	COLLAR O.D. TURN	41.25	1047.8	43.40	1102.4	45.50	1155.7	46.50	1181.1	50.50	1282.7	54.50	1384.3
E	COLLAR THICKNESS	7.0	177.8	7.25	184.2	7.63	193.8	7.63	193.8	9.0	228.6	9.50	241.3
F	THRUST PAD O.D.	41.0	1041.4	43.0	1092.2	45.0	1143.0	46.0	1168.4	50.0	1270.0	54.0	1371.6
G	RETAINER RING BORE	20.50	520.7	26.0	660.4	26.75	679.5	26.75	679.5	27.50	698.5	31.5	800.1
H	PAD BORE	18.0	457.2	25.0	635.0	26.50	673.1	26.50	673.1	27.0	685.8	30.0	762.0
J	ASSEMBLY THICKNESS	7.25	184.2	8.50	215.9	9.0	228.6	9.0	228.6	10.00	254.0	10.63	270.0
K	CASING KEY WIDTH	1.75	44.5	1.75	44.5	1.75	44.5	1.75	44.5	2.0	50.8	2.13	54.1
L	CASING KEY HEIGHT	.63	16.0	.63	16.0	1.25	31.8	1.38	35.1	.75	19.1	1.13	28.7
M	CASING KEY LENGTH	3.75	95.3	3.0	76.2	1.75	44.5	1.75	44.5	3.0	76.2	2.13	54.1
N	COLLAR TO KEY LENGTH	1.88	47.8	1.88	47.8	2.50	63.5	2.50	63.5	3.25	82.6	3.19	81.0
O	COLLAR KEY WIDTH	—	—	—	—	—	—	—	—	—	—	—	—
P	COLLAR KEY DEPTH	—	—	—	—	—	—	—	—	—	—	—	—
Q	OIL ANNULUS DIAMETER	37.0	939.8	41.75	1060.5	44.0	1117.6	44.0	1117.6	47.75	1212.9	51.75	1314.5
R	OIL ANNULUS HEIGHT	1.63	41.4	2.0	50.8	3.0	76.2	3.0	76.2	3.50	88.9	3.50	88.9
S	MAXIMUM SHAFT SIZE	15.75	400.1	23.0	584.2	25.13	638.3	24.0	609.6	25.0	635.0	26.75	679.5
T	OIL INLET HEIGHT	.25	6.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	24.5
U	OIL INLET WIDTH	4.0	101.6	4.0	101.6	5.0	127.0	5.0	127.0	5.0	127.0	5.0	127.0

PLEASE NOTE: FINAL APPLICATION DIMENSIONS SHOULD BE OBTAINED FROM WBC VERIFIED DRAWING.
* ENGLISH (AREA PER SIDE) IS IN SQUARE INCHES; METRIC (AREA PER SIDE) IS IN SQUARE CENTIMETERS.

SUPPORTING TECHNICAL DATA

Variations

Changes to the designs outlined in this catalog are often made when the specific operating conditions indicate that some modification is necessary or beneficial. Three specific variations are briefly discussed here. These are:

a) Offset pivots
b) CrCu backed pads
c) Different number of pads

Offset Pivots

For machines that rotate primarily in one direction, circumferentially offset pivots are often used to improve bearing performance. Historical theoretical analysis indicated that a pivot placed circumferentially about 60% of the pad arc length from the leading edge provided maximum load capacity, and that a pivot at the center (50% location) resulted in zero load capacity. Center pivot pads do, of course, have significant load capacity which is explained when pad deformations and viscosity variations are considered. Early analyses did not have the means to include these effects, and this led to the conclusions regarding the load capacity of center pivot pads.

Offset pivots do result in improved performance, as compared to center pivot pads, for rotation in the direction of the offset. For rotation opposite the offset, there is a degradation in performance. Improved analysis means (primarily due to the use of computers) include the effects of pad deformations, viscosity variations and other factors not practical to consider in the early procedures, and a clearer picture of the details of the pad performance can be obtained. These analytical results indicate that **the pivot location for best performance may well be beyond the 60% position** often accepted.

Bearing (pad) performance is normally judged by minimum oil film thickness and/or maximum pad temperature. A third consideration may be maximum oil film pressure, particularly in conjunction with the metal (babbitt) temperature at the location of maximum pressure. Figures 22 through 24 give examples of the types of analytical results obtained from these programs. Similar data is also given in Ref. 1.This also includes experimental data from tests on a specific bearing geometry.

Figure 25 gives similar data from tests on production type bearings.

The agreement between the configurations of the analytical and experimental temperature curves lends credence to the analytical process and thus to the film thickness and pressure predictions. The general conclusion is that **pivot locations beyond 60% can provide significant improvements in pad (bearing) performance.**

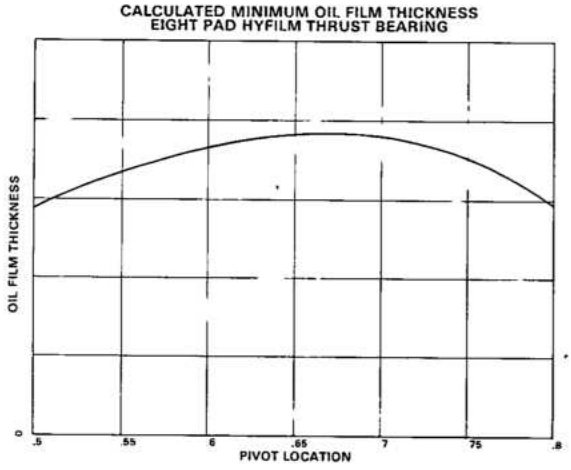


Figure 22

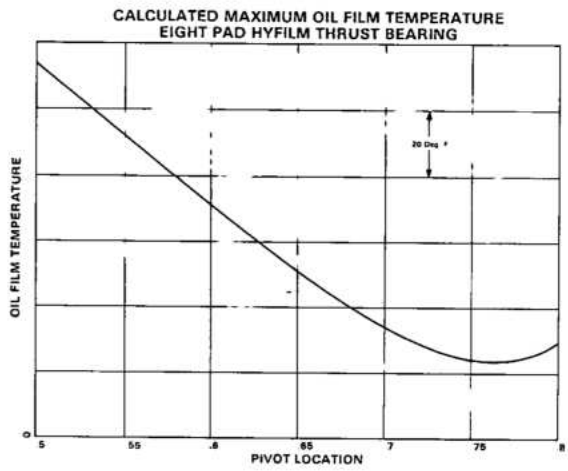


Figure 23

Chrome Copper (CrCu) Backed Pads

Thrust pads are commonly made with a babbitt face on a steel backing. Pad deformations, which are critical to the pad (bearing) performance, are strongly influenced by the pad backing material. With steel, the relatively high modulus of elasticity limits the deflections of the pad due to the oil film pressure load, while the relatively low thermal conductivity gives relatively high temperature gradients through the pad thickness and thus relatively large thermal deflections. This is particularly true for high speed, heavily loaded bearings where the oil film temperatures are high.

The use of a backing material with higher thermal conductivity than steel can reduce these thermal gradients (and thus thermal distortions). Such materials commonly have a lower elastic modulus, however, and so the reduction in thermal distortions is obtained at some expense (increase) in the pressure (load) distortions.

Chrome copper has proven to be a beneficial pad backing material. Thermal conductivity close to that of pure copper is maintained while the presence of the chrome provides significant strength increase. The net result for high speed bearings is an improvement in performance as compared to steel backed pads.

Experimental evidence of the decrease in pad temperature is reflected in Figure 25.

Different Numbers of Pads

The thrust bearings tabulated in this catalog show pad complements from six to nine. Of more specific interest than the number of pads in a bearing are the proportions of the individual pads. It is common to refer to the arc length of a pad (at mid-radius) as "B". Similarly, the radial length is termed "L". The ratio, B/L is a pad geometry variable of value in bearing comparisons.

For the "standard bore" series of six pad thrust bearings (pad OD to ID ratio of 2), the B/L ratio is 4/3. For the "large bore" series of six pad bearings, this ratio is 3/2. From the standpoint of bearing performance, it is generally desirable to have this ratio about 1/1. This gives better control of pad deflections, critical in determining bearing performance.

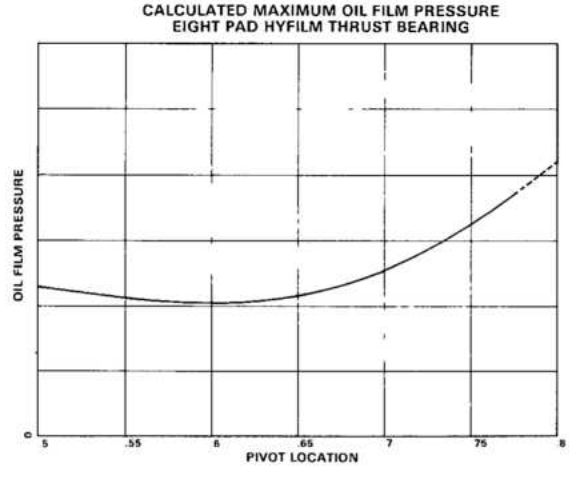


Figure 24

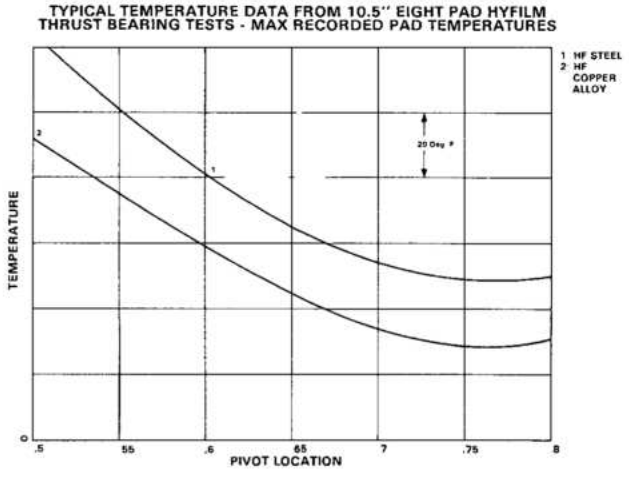
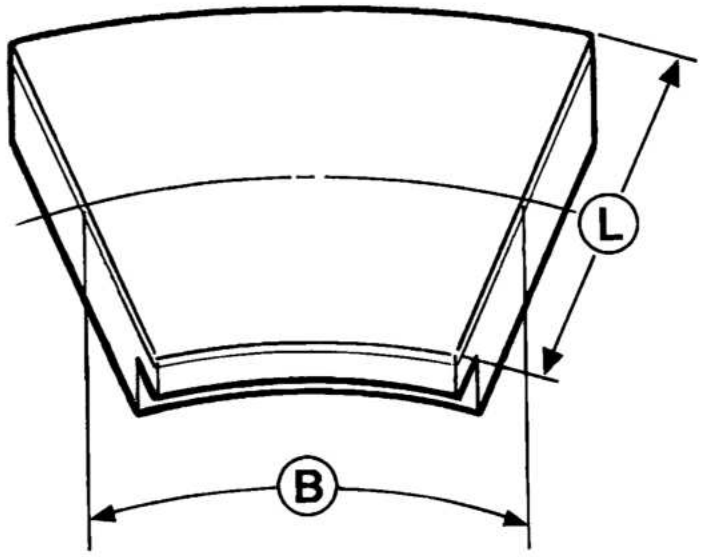


Figure 25

In newer bearing designs, such as the HyFilm line, this 1/1 ratio for pad proportions is used. This results in an eight pad complement for the series interchangeable with the "standard bore" six pad bearings, and a nine pad complement for the series interchangeable with the"large bore" six pad bearings.



PAD LENGTH TO WIDTH RATIO

Custom Bearing Designs

For many applications, the high load capacity of a bearing with a pad OD/ID ratio of 2 is not required nor is it desired due to the unnecessary power loss developed. However, a large shaft diameter may dictate the use of one of these bearings in the absence of some other choice. In this event, Waukesha Bearings should be contacted to provide a bearing either from an extensive file of "specials" that have been designed, or to generate a design specifically tailored to the application under consideration. With the use of computer aided engineering and drafting tools, the latter option is often the best.

These design tools and experimental data and capabilities provide the ability to recommend thrust bearings capable of efficiently performing in your specific application.

References

1- Gardner, W., "Tilting Pad Thrust Bearings - Influence of Three Design Variables," **Proc. 13th Leeds-Lyon Tribology Symposium**, 1986.

2- Gardner, W., "Performance Characteristics of Two Tilting Pad Thrust Bearing Designs," **Proc. JSLE International Tribology Conference**, 1985.

3- Gardner, W., "Performance Tests on Six-Inch Tilting Pad Thrust Bearings," **Journal of Lubrication Technology, Transactions ASME**, v. 97, No.3, 1975.

BEARING APPLICATION QUESTIONNAIRE

(Fill out Portions that Apply)

Bearing Style: _____

Shaft Diameter: _____

Shaft Diameter thru Collar: _____

Will Collar be Furnished by WBC? _____

Shaft Speed, RPM: Normal _____ Max _____ Min. _____

Vertical or Horizontal Shaft: _____

Load, Thrust: Normal _____ Max _____ Max Transient _____

Reverse Thrust Load: _____

Load Radial: Magnitude _____ Direction _____

Lubricant Type and Viscosity: _____

Lubricant Inlet Temperature _____

Split or Solid: _____

Uni- or Bi-Directional: _____

Insulation Required: _____

Instrumentation: YES _____ NO _____

- Thermocouples: _____
- Resistance Temperature Detectors (RTD): _____
- Style of Case: _____
- Lead Material: _____
- Lead Length: _____
- Overbraid: _____
- Proximity Probes: _____
- Load Cells: _____

Do Military or Industrial Specifications Apply?: _____

Waukesha Bearings and Seals for a Broad Range of Applications

In addition to tilting pad thrust bearings, Waukesha offers a broad range of bearings and seals for industrial and marine application. The following is a brief description of other products offered.

Standard Journal Bearing

Waukesha Bearings Corporation offers split or solid bearings, plain or lobe type bores and bearings with or without thrust faces. Bore sizes range from 1" to 50" diameter. Your most challenging fluid film bearing needs can be met at Waukesha.

Sternlign Bearings

Sternlign units are patented tilting pad tailshaft bearings.

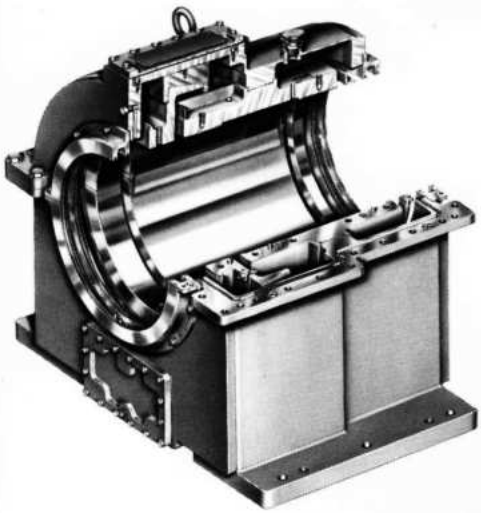
Tilting Pad Journal Bearing

Stability is the primary advantage of this type bearing. Each pad tilts on a virtually frictionless pivot. This provides inherent suppression of oil film instabilities, a common problem with other types of fluid film bearings in turbo-machinery. Excellent cooling characteristics allow tilting pad bearings to operate under heavy loads and or high speeds.

Stern Tube Bearings

Waukesha oil lubricated stern tube bearings are designed to last the life of the vessel. They feature cast ductile iron shells lined with centrifugally cast tin base babbitt.

With Waukesha "Sternmod" systems, stern tube bearings are pre-installed into mounting sleeves or full length stern tubes for installation into the hull with chocking compound. This configuration can save considerable installation time and expense.



Sternguard Mark II Seal

Proven performance and reliability have earned the Mark II Stern Tube Seal a superior reputation. Used with Waukesha oil lubricated stern tube bearings, they are available in standard sizes for shafts from 5 to 37 inches diameter.

Line Shaft Bearings

Waukesha line shaft bearings are known for quality and reliability. Standard units are self-aligning, disc lubricated design. Sizes for shafts to 36 inches diameter are standard with other sizes available.

WAUKESHA BEARINGS

A DOVER DIVERSIFIED COMPANY

N14 W24200 Tower Place
P.O. Box 1616
Waukesha, WI 53187-1616 U.S.A.
Telephone: 414-547-3381
Telex: 4311042/Fax: (414) 547-5508